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**AGRICULTURAL
DEVELOPMENT in
NICARAGUA**

**With Particular Reference to the
Organization and Programs
of the Ministry of Agriculture**

September - October, 1965

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A report of a study by E. T. York and Hugh Popenoe
representing the USDA PASA Team in Nicaragua.

U.S. Department of Agriculture
cooperating with
Agency for International Development

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Ministry of Agriculture

September - October, 1965, + 3a

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A REPORT OF A STUDY //

by ...

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E. T. York, and Hugh Popenoe

Representing the

2
USDA/PASA Team in Nicaragua //

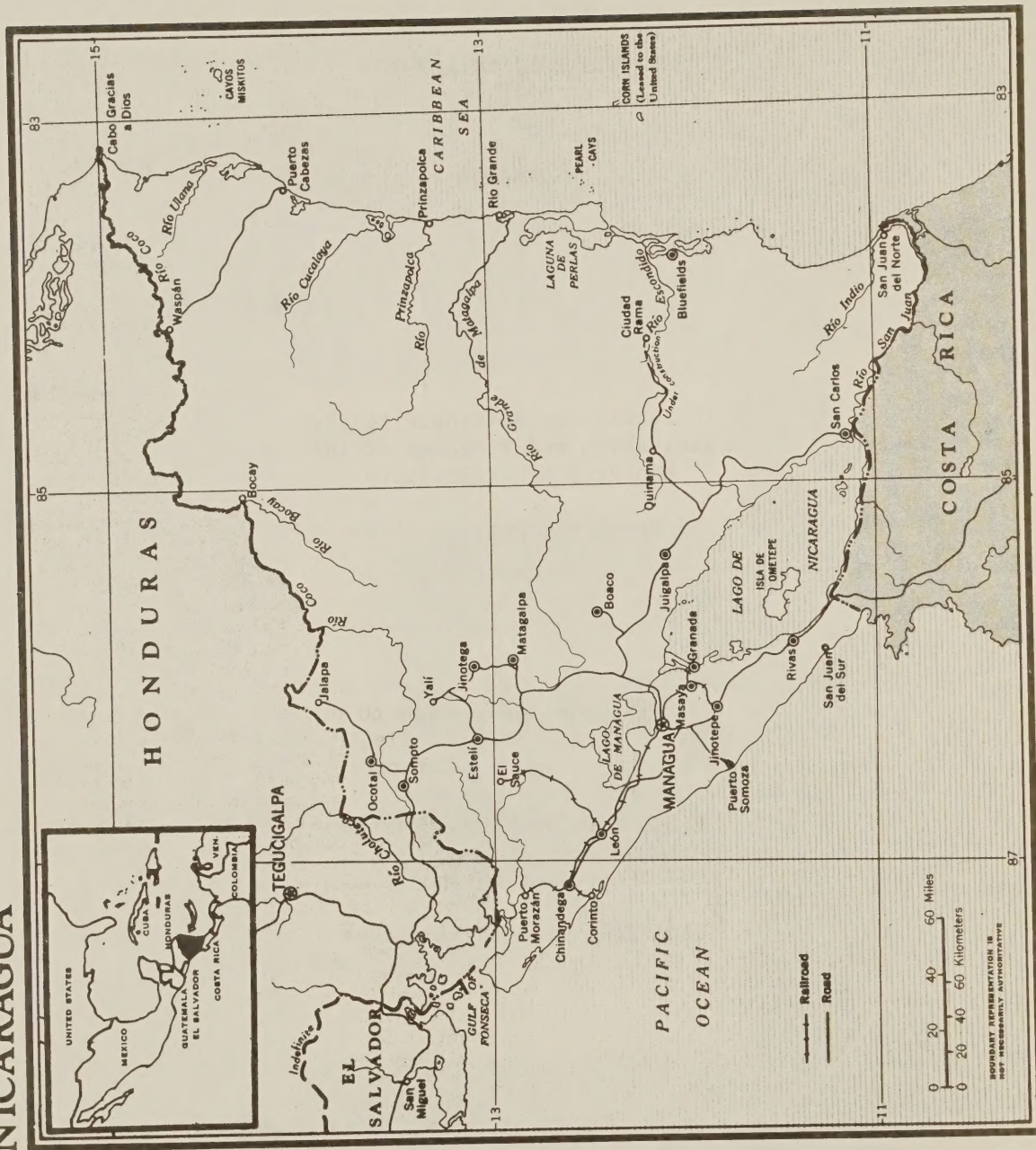
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U.S. DEPARTMENT OF AGRICULTURE //

in cooperation with

AGENCY FOR INTERNATIONAL DEVELOPMENT

NICARAGUA



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FOREWORD

On June 11, 1965, Nicaragua's Minister of Agriculture, Alberto Reyes, submitted a request to the AID Mission in Nicaragua for assistance in an analysis of the organization and programs of the Ministry. Particular emphasis was placed on the need for a study of the research, teaching, and extension functions and the possible need for some restructuring of these programs in order that they might make the maximum contribution to the development of Nicaraguan agriculture.

In response to the request, the AID-USDA/PASA team in Nicaragua arranged for the services of Dr. E.T. York, Provost for Agriculture, University of Florida (administrative head of the University's total research, teaching and extension programs in agriculture), and Dr. Hugh Popenoe, Director of the University of Florida's Center for Tropical Agriculture. The study of Drs. York and Popenoe covered a period of approximately 6 weeks in September and October, 1965. This report is a summary of their findings and recommendations.

Much of the background for this report came from personal interviews with many government, business, and agricultural leaders throughout the country. Further background was provided by numerous publications, reports of previous studies, etc., relating to Nicaragua and its agriculture. A summary of these sources of information is provided herein.

The Ministry of Agriculture requested a frank and objective analysis of its programs. The study team has attempted to provide this type of analysis. It should be recognized that while the report may appear to be critical of many aspects of the present program, the situation as it now exists has developed over a period of a decade or longer and is obviously not the sole responsibility of those presently in charge of the Ministry's programs. The first step in correcting any problem is to recognize that the problem exists. There are many indications that the administration of the Ministry of Agriculture recognizes that there are serious weaknesses in its organization and is conscientiously attempting to make improvements.

This report is not confined to the Ministry of Agriculture alone. Particular attention is directed to the need for better coordination among all groups concerned with agricultural development in Nicaragua. Consequently, the report includes a brief resume of the various agriculturally related organizations and institutions, along with recommendations concerning more effective coordination of the efforts of all these groups.

The authors are particularly indebted to the various officials of the Government of Nicaragua, the Ministry of Agriculture, and the autonomous agencies, many of whom are listed at the end of this report. These individuals most cooperatively supplied background information and suggestions, many of which are included in this proposal. Without their unselfish help, an objective analysis of the current agricultural situation in Nicaragua would have been most difficult.

The report emphasizes the outstanding potential which Nicaragua has for agricultural development. It is the earnest hope of the study team that appropriate improvements and adjustments can be made in Nicaragua's agricultural programs to enable the country to more nearly realize its full potential for agricultural development.

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AGRICULTURE IN NICARAGUA

Agriculture truly represents the foundation of the Nicaraguan economy. In 1964 the agriculture sector (including livestock) was responsible for approximately 36 percent of the nation's gross domestic product. By comparison, commerce and industry, the next two most important contributors to the GDP, accounted for only 20 percent and 14 percent respectively.

Agricultural products accounted for approximately 85 percent of the country's exports. Two crops, cotton and coffee, were responsible for two-thirds of all export sales last year.

Physical Resources

According to the 1957-58 census, Nicaragua had 7.3 million acres of farm land, approximately two-thirds of which was in crops and pastures. The 1963 agricultural census indicated that there were some 100,000 farms in Nicaragua. One-third of these were less than 5 manzanas in size (1 manzana equals 1.74 acres). In fact, 62 percent of all farms were less than 20 manzanas. Only 1.5 percent of all farms were over 500 manzanas.

Nicaragua has relatively large areas of land which could be used for agricultural purposes, not only in the eastern part of the country, but in the Pacific and central regions as well. Furthermore, the climate, topography and soil conditions are generally favorable for the further development of a wide variety of crop and livestock enterprises.

Agricultural production in the Pacific zone is largely at the mercy of irregular rainfall during the rainy season. To help overcome this handicap, the Government is encouraging irrigation and several thousand manzanas have been placed under irrigation by individual farmers. Possibly as much as 175,000 acres could be irrigated eventually under large-scale projects. A loan of \$2.6 million has been granted by the World Bank for the first such project in the Department of Rivas.

Human Resources

The population of Nicaragua in 1965 is estimated to be approximately 1,634,000 with 60 percent of the people living in rural areas. The 1963 census showed 66.5 percent of the "economically active" population was engaged in agriculture. With an annual rate of growth of 3 percent, it is estimated that the population will double within the next 20 years. Nearly half (45.9%) of the population is below the age of 14, usually considered to be an economically unproductive age group.

Although there are several centers of population concentration, Nicaragua is not faced with severe population pressure and is the least densely populated country in Central America. The Atlantic Plain, for example,

representing more than 50 percent of the land area of the country, has only 7-8 percent of the population. The overall population density is 33 persons per square mile, approximately one-tenth that of El Salvador. The fact that land ownership is concentrated among a relatively few people has brought pressure for land reform. In 1957, it was estimated that 200 land owners held more than one-third of the privately owned land.

In 1950, 63 percent of the total population and 80 percent of the rural population were illiterate.^{1/} Preliminary estimates of the 1963 census showed a drop in rate of illiteracy to approximately 50 percent of the total population. However, illiteracy is still a major problem among rural people, making the task of agricultural development more difficult.

The 1963 census indicates that the rural population is composed of 909,225 individuals in 148,901 families, or an average of 6.1 members per family. The average annual income of the rural family in Nicaragua is 2,359 cordobas. The total rural income is 351,000,000 cordobas, or an average of 386 cordobas per year, per capita.

Dietary Levels

In 1959-61, it was estimated that the Nicaraguan people had an average daily caloric intake of 2190 -- almost one-third of which came from corn. This compares with an estimated minimum daily requirement of some 2500. For the period 1959-61, the average Nicaraguan consumer met 86 percent of the "USDA minimum standard" in terms of caloric intake, 97 percent of protein and 110 percent of fat. More recent studies indicate some improvement in average diets since the 1959-61 period. There is, of course, a wide range in quality of diets among the high, middle and low income classes -- with the dietary level of the lower groups far below minimum standards.

Agricultural Enterprises

Tables 1,2 and 3 show the trend in the production of major agricultural commodities since a three year base period, 1952/53 - 1954/55. Changes in the production of these commodities reflect a very significant pattern.

Cotton production has been increasing very rapidly in recent years. In fact, total production has gone up some 400 percent since the base period. Production in 1964/65 was some 25 to 30 percent higher than it was the previous year.

Nicaraguan cotton yields are on the average some of the highest in the world. Most of the production is in the hands of relatively large farmers who are, in the main, using good cultural practices. Cotton is by far Nicaragua's most important export crop -- accounting last year for almost one-half of the country's export earnings.

^{1/} Among those 10 years of age and older.

Coffee - Most of Nicaragua's coffee is produced in the mountainous areas of the country, at altitudes ranging from 1500 to 3000 feet. Cultivation is generally done by small landholders on farms of 100 manzanas or less.

Table 1: Area planted to major crops in Nicaragua, in selected years.

Crops	Area (Manzanas ^{1/})		
	Average 1952/53-1954/55	1959/60	1964/65
Sesame	30,793	22,982	12,232
Cotton	75,838	94,756	192,254
Rice	36,386	29,784	32,106
Coffee	85,467,618 ^{2/}	109,643,543 ^{2/}	125,849,428 ^{2/}
Sugar Cane	24,823	28,141	30,432
Beans	55,130	56,358	70,463
Corn	180,943	184,186	249,285
Sorghum	61,890	69,098	68,437

^{1/} Manzana = 1.74 Acres

^{2/} Coffee-trees

Table 2: Yield of major crops in Nicaragua in selected years.

Crops	Yield (Quintals/ Manzana)		
	Average 1952/53-1954/55	1959/60	1964/65
Sesame	8.29	7.90	10.31
Cotton <u>2/</u>	7.15	6.36	14.11
Rice	14.47	14.82	20.48
Coffee	8.32 <u>3/</u>	7.54 <u>3/</u>	8.66 <u>3/</u>
Sugar Cane	33.01 <u>4/</u>	36.87 <u>4/</u>	36.45 <u>4/</u>
Beans	12.27	8.50	11.13
Corn	14.50	11.67	13.79
Sorghum	19.26	12.34	14.97
<u>1/</u> Quintal = 101.43 Pounds		<u>3/</u> Ounces/Tree in production	
<u>2/</u> Lint Cotton		<u>4/</u> Tons (2000 pounds)	

Table 3: Total production of major crops in Nicaragua in selected years.

Crops	Production (Quintals)		
	Average 1952/53-1954/55	1959/60	1964/65
Sesame	258,974	181,632	126,084
Cotton <u>1/</u>	573,469	602,235	2,712,031
Rice	534,308	441,531	657,398
Coffee	456,260	516,840	681,791
Sugar Cane	820,036 <u>2/</u>	1,037,624 <u>2/</u>	1,109,173 <u>2/</u>
Beans	672,191	478,959	784,589
Corn	2,632,187	2,149,637	3,463,991
Sorghum	1,179,183	852,795	1,024,593
<u>1/</u> Lint Cotton			
<u>2/</u> Tons (2000 pounds)			

Coffee production has increased some 50 percent since the early 1950's. Most of this expansion has resulted from the increased plantings in the early and mid 1950's rather than from higher yields. From all indications Nicaragua has not kept up with some of its neighbors, such as Costa Rica, in developing and applying improved technology to coffee production.

Pressures are being exerted on marginal producers to shift to other agricultural enterprises, such as in one coffee producing region where the dairy industry is being stimulated by the installation of a milk plant sponsored by INFONAC.

Most of Nicaragua's coffee crop is exported to fulfill the country's quota established under the International Coffee Agreement. Nicaragua's quota in 1965 was 433,000 bags. There is a surplus estimated to be as high as 140,000 bags of coffee from last year's crop.

Sugar - Nicaragua's production of centrifugal sugar has increased sharply since the early 1950's. There have been only modest increases in yields during this period. About one-half of the total production is accounted for by small farmers. The balance is produced by large sugar estates.

Sesame seed production has generally declined since the early 1950's. Most of the crop is exported, with about two-thirds of the total going to the United States. This decline has resulted in part from low prices as well as from competition by cotton for good land. There has been little improvement of yields in recent years.

Beans, Corn and Rice represent the most important food crops in Nicaragua. Corn is the number one food produced in Nicaragua and forms the basis of the daily diet for a majority of the people, especially those in the lower and middle income brackets. It is also the leading grain crop in every department of the country in terms of area planted. Small farmers account for most of the production of these crops.

One of the most disturbing features of Nicaraguan agriculture is the failure to make substantial gains in yields and production of all three of these basic food crops. Despite efforts by the government to stimulate production through price supports and other means, increased quantities of these crops, particularly corn and rice, are being imported to meet the demands of an ever expanding population. There is a great urgency to reverse this downward trend in per capita production of these major food crops, especially since the Central America Common Market gives member countries a premium market for surplus production.

Grain Sorghum - Large areas are being planted to grain sorghum. However, like corn, yields of grain sorghum are no higher today than they were 10 - 15 years ago.

Tobacco and Bananas - Tobacco and banana culture is being sponsored by INFONAC in an effort to develop new sources of foreign exchange earnings and to diversify the nation's agriculture. Excellent results were

obtained with a 40 hectare planting of Havana type tobacco in 1964, and acreage was expanded to around 68 hectares in 1965.

Farmers in the Leon and Chinandega regions are participating in the INFONAC - sponsored program aimed at reviving the banana industry, an industry which exported more than a million stems of bananas in 1940, but only 63,000 in 1961. The drop in exports was due largely to Panama Disease on the Atlantic coast.

The new program being developed on the Pacific coast led to a 1964 banana export of 1.1 million boxes (40 pounds). In early 1965 the banana project suffered two severe setbacks--a blowdown of about half the plants and the stevedore strike in the United States.

Beef Cattle - Government sponsored programs of technical assistance are aimed at increasing beef production for export. There has been no official survey of livestock numbers since 1957 when the total cattle population was put at 1,331,000 head. Estimates, however, indicate that the 1964 population was 1,821,000 head.

In its effort to stimulate production, INFONAC has imported over 1500 head of pure-bred cattle in recent years, mainly from the United States, for distribution on credit to Nicaraguan cattlemen. The Inter-American Development Bank recently made a loan to INFONAC totaling \$1.1 million for further purchases of breeding stock in the United States.

At the end of 1964, the Inter-American Development Bank authorized a \$9.1 million loan to the Nicaraguan National Bank to help finance a comprehensive program to provide additional assistance for developing the Nicaraguan beef industry. The National Bank plans to match the IDB with about \$12.7 million of its own funds. The aim of the program is to stimulate beef cattle production by increasing the rate of reproduction, reducing mortality rates, achieving higher meat yields and lowering the slaughtering age.

In 1963 there were some 210,000 head of cattle slaughtered, 61 percent above the previous five-year average. Beef exports, which began in processed form in 1958, reached a value of \$8.4 million in 1963. Extensive slaughter in 1963 due to a summer drought resulted in a sharp decline in exports in 1964 and 1965. Much of Nicaragua's export beef is processed by a firm in Managua which slaughters about 250 animals per day, mostly for export. This very modern slaughtering facility was developed under the sponsorship of INFONAC.

Swine - There is no organized commercial swine industry in Nicaragua, and most hogs are raised under rather primitive conditions by small farmers. INFONAC plans to sponsor programs aimed at developing the swine industry.

Dairy Products - The government has encouraged greater production of dairy products in recent years. The number of milk cows in Nicaragua is estimated to be about 757,000 head, of which approximately 375,000 are milked. Milk production was estimated at 47 million gallons in 1964. In 1964 the pasteurizing plants in Nicaragua area received some 5.7 million gallons.

Forestry - Forest products constitute a declining share of the gross domestic product. This decline can be attributed primarily to over-cutting. The industry also was adversely affected by the loss of timberland to Honduras, the loss of Cuban markets for Spanish cedar and the decline in prices for wood products.

In the long run, the outlook for lumber production appears to be good if appropriate management practices can be introduced to bring cut-over areas back into production and to protect remaining stands of marketable timber.

Agriculture and the Nation's Economy-Problems and Potentials

The problems and potentials of the Nicaraguan economy are closely entwined with the problems and potentials of Nicaraguan agriculture. This is well illustrated by the three distinct periods through which the Nicaraguan economy has passed since 1950.

The period from 1950-1955 was one of relative prosperity. The GDP grew at an annual rate of 8.3 percent. International reserves increased from \$2.2 million in 1950 to \$14.9 million in 1955. The value of exports more than doubled and the terms of trade improved by 39 percent.

Much of this favorable economic climate could be related directly to an increase in the value of cotton exports from \$1.8 million in 1950 to \$31.0 million in 1955--and a corresponding increase in the value of coffee exports of from \$17.3 million to \$27.9 million. Government revenues, more than 60 percent of which were derived from foreign trade, tripled.

The period 1956-60 was marked by economic recession. The value of exports declined by 21 percent, the terms of trade deteriorated by 32 percent, giving a negative annual growth rate in per capita gross production. Again the economic climate was related to the status of agricultural exports, particularly cotton and coffee. The value of cotton exports in 1960 was less than half that in 1955. There was a sharp drop in value of coffee exported due to a decline in prices. There were government deficits in 1957 and 1960.

In 1961, the country saw the beginning of another prosperous period, during which the GDP has grown at an average annual rate of 8.1 percent. As in the 1950-55 period, the principle factor determining the increase was the rise in the production and export of agricultural commodities, particularly cotton. The value of cotton exports increased from \$14.7 million in 1960 to \$51.4 million in 1964. The value of coffee exports grew from \$19.2 million to \$21.3 million. The value of beef exports reached the level of \$4.1 million in 1961, \$6.0 million in 1962, and \$8.2 million in 1963. International reserves increased from \$14.4 million at the end of 1961 to \$41.3 million at the end of 1964. Government revenues rose steadily along with an expansion in credit.

The obvious dependence of the Nicaraguan economy upon agriculture presents some real problems and challenges to the Nicaraguan government. The period of rapid economic growth enjoyed by the country in recent years is due in large measure to external factors over which the Nicaraguan government has little or no control--favorable export markets, particularly for cotton, and good weather conditions for the production of cotton and other export crops.

At present, however, there are several rather ominous clouds on the horizon which could spell serious difficulty to the Nicaraguan economy even within the next one or two years.

- (1) While cotton production has been increasing very rapidly in the last three of four years, a severe drought in July and August is expected to result in a reduction in size of this year's crop by as much as 25 percent from expected levels (based on area planted and past yields). This one factor alone could decidedly slow down if not stop the rapid rate of economic growth enjoyed by the country in the last five years.
- (2) With a surplus supply of cotton in world markets, there is a distinct possibility of some depression in world market prices, making it essential for Nicaraguan growers to continue to improve their production efficiency if they are to remain competitive in world markets. This development also makes less likely the prospect for a continuation of the type of expansion of the cotton industry which Nicaragua has experienced in recent years. Further expansion is also limited somewhat by the fact that much of the better cotton land is already in use.
- (3) Coffee, the second most important export crop, is also facing some difficult adjustments in the immediate future. World coffee markets are glutted and prices seriously depressed. Nicaraguan production this year is far in excess of its quota, resulting in a substantial surplus. Much coffee is being grown in marginal areas and there has been little or no improvement in average coffee yields in recent years. As a result the competitive position of the Nicaraguan coffee producer is not good.
- (4) External factors are not favorable for any marked increase in sugar production and exports.
- (5) An unprecedented rate of increase in imports could further jeopardize the balance of trade unless export sales also continue to expand.
- (6) Nicaragua is facing a serious problem with its basic food crops--corn, beans, and rice. With little or no improvement in yields and total production in recent years and with a rapidly growing population, the per capita production of these food crops has actually declined over the last decade. This is making it necessary to import these commodities, merely to maintain the present dietary level of the Nicaraguan people.

These situations have great implications to the economy of the country and to the welfare of its people. In view of the importance of the agricultural sector and the relatively poor state of most segments of Nicaraguan agriculture, it seems imperative that greater attention and greater support be given to further developing and strengthening the agriculture of the country.

Indicative of the present problem and the imbalance of resource input is the fact that at the present time the Ministry of Agriculture which has responsibility for the country's research, extension and college-level training in agriculture--in addition to many regulatory and other functions--receives less than 3 percent of the total national budget. Yet these programs of the Ministry are vital to the further growth and development of Nicaraguan agriculture. Indeed, the strength and the effectiveness of the country's agricultural institutions--the organizations concerned with research, education, credit, etc.--will in a large measure determine the future development of Nicaraguan agriculture. Consequently, this report will concern itself with a brief analysis of these organizations--their mission, their effectiveness and their limitations. Specific recommendations will then be made for improving the structure and function of certain of these organizations, particularly those associated with the Ministry of Agriculture.

AGRICULTURAL INSTITUTIONS IN NICARAGUA

Ministry of Agriculture

The organizational chart for the Ministry is shown in Figure 1. For the purpose of discussion, functions may be classified in four categories--research, extension, teaching, and special services. Most of the very few research activities are carried out at the experiment station "La Calera", which is located 8 miles from Managua. Extension functions are distributed through 17 agencies in every department of the country. The National Agricultural School provides the only college curriculum in agriculture in the country, and is a semi-autonomous agency within the Ministry. Special services include such functions as pest control and quarantine, registration and certification of products, inspection, and veterinary services.

The budget for the year 1965 was C\$ 11,592,754. Approximately 72 percent of the budget is allocated for salaries.

The Ministry has had serious problems with morale of its personnel, budgetary limitations, quality of the services, and competition from several other agencies, as well as considerable political interference. These problems have resulted in several proposals to create a semi-autonomous agency within the Ministry called ITAN (Instituto de Tecnologia Agropecuaria de Nicaragua) which would include research, extension and agricultural education. A proposal

has been made to the United Nations Special Fund for a grant of approximately one million dollars to support reorganization into such a unit. Details of the proposal for this administrative unit are described in the Rural Development Report by James et al (2).

Although a few outstanding men are scattered throughout the Ministry, it has been difficult to retain the better personnel. The salaries are not competitive with other agricultural agencies in Nicaragua serving some of the same functions. For example, veterinarians earn C\$2500 month in the Ministry, whereas they are paid C\$4000 by the National Bank. However, the total salary figure is somewhat misleading since some employees in the Ministry only work a 34 hour week compared to 40 or 44 for most other agencies, although staff of the experiment station and Extension service usually work at least 40 hours a week. Furthermore, since the official working hours for many programs in the Ministry are from 7:00 a.m. to 1:00 p.m., some employees are holding down an additional job in the afternoon. Some may teach at the agricultural school where they are paid by the hour. Others work in agriculturally related organizations--in itself an unfortunate situation since the possibility exists of compromising the best interests of the Ministry. There would appear to be considerable laxity in observing established working hours.

The Ministry has many personnel hired for political reasons and these employees often do not feel bound by normal regulations. The Extension Service has several political appointees and it is reported that some of these report to their respective offices once a week or less.

Another problem is the large turnover in personnel which acts as a detriment to the development of long-range programs and discourages many of the better staff. Three different Ministers have been appointed in the last two years. The Extension Service has some 40 percent turnover in personnel each year.

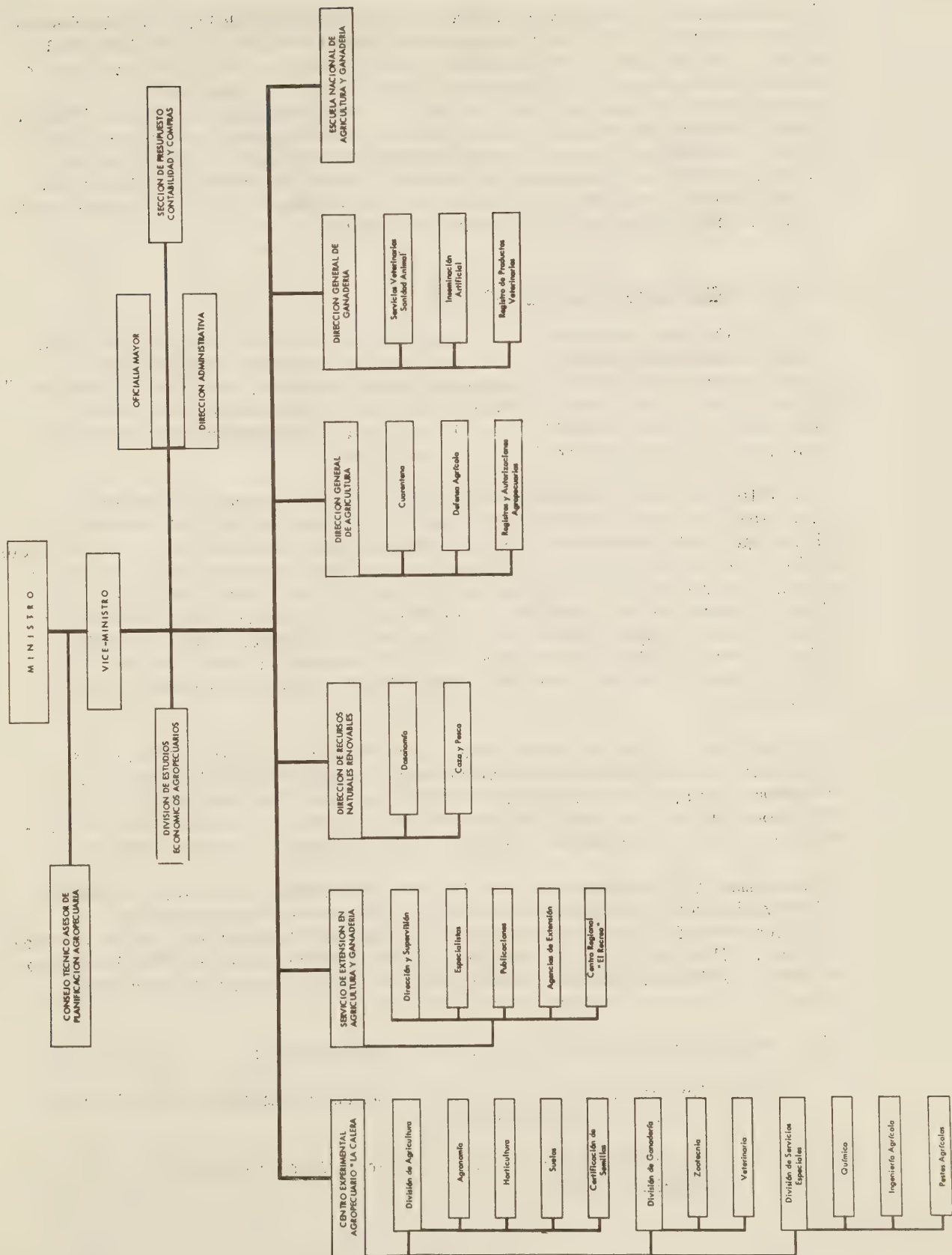
Few incentives are available to employees except for the possibility of changing jobs. No merit or performance reports are used nor are merit raises normally available. No general salary increase has been awarded in the last decade, though some individual salaries have been raised. Morale is often low because of the large amount of interference apparent in the arbitrary transfer of funds, personnel, and vehicles.

The process involved in the determination of the budget for the Ministry is somewhat complicated. A budget officer (official presupuestario) is appointed by the Ministry of Finance, but is located in the Ministry of Agriculture and paid from their funds.

The Ministry of Finance designates how much money is to be allocated to the Ministry of Agriculture. Agriculture must then present individual budgets for the various units within the assigned amount. The heads of programs, together with officials of the Treasury and National Budget, cooperate with the President of the Republic in working out an adjustment and revision of the budget of each program. Afterwards, the budget is presented to the Director of the National Budget.

Figure 1

MINISTERIO DE AGRICULTURA Y GANADERIA



The principle difficulty in budgetary matters, in addition to inadequate budgetary support, is that the approved annual budget is distributed quarterly on an item by item basis. This procedure does not take into consideration seasonal differences in expenditures connected with the growing season of agricultural crops. In addition, the allocated funds for any quarter are usually less than the amount shown in the approved budget. The disparity in the way in which the budget is distributed, and the practice of quarterly allotments impede the most efficient use of the already insufficient funds at the appropriate time in connection with planned activities in the work calendar.

Agricultural Experiment Station (EEA)

Almost all of the research activities of the Ministry are now located at the Experiment Station "La Calera", which is 12 km from Managua. Research activities formerly embraced other stations such as "El Recreo" in the Atlantic lowlands, "Masatepe" in the central highlands, and "Chinandega" in the fertile Pacific lowlands. In recent years research has gradually been concentrated at "La Calera".

"La Calera" is in an unfortunate location for an experiment station, especially when it must serve the needs of a country as diverse as Nicaragua. The Experiment Station comprises 217 hectares of a calcareous soil, which is not typical of the important agricultural areas of Nicaragua. Obviously, this limited area does not lend itself well to extensive livestock and pasture work, or to large scale field experimentation. The proposed expansion of the nearby airport "Las Mercedes" will further limit the area available for research. The Station has eight buildings for offices and laboratories, and miscellaneous other structures.

The total budget for the Experiment Station was C\$3,484,938 for 1965, slightly less than one-third of the entire budget for the Ministry. Minimum salary for technicians is C\$1800/month. The Director of the Station reported that only 42 percent of his present budget goes to research, a large proportion of the remainder goes to service projects.

Approximately 44 technicians work in the Experiment Station. Of these, 25 have University training including 2 who have a masters degree. Fourteen received their University Training in the National Agricultural School. The other 19 have had some professional training. Thirty-four members of the professional staff resigned in the last 3 years - more than a 2/3 turnover in that period of time.

"La Calera" is composed of the following divisions:

Division of Agriculture -- Departments of Agronomy, Horticulture,
Soils, and Seed Certification

Division of Livestock -- Departments of Animal Husbandry, and
Veterinary Science

Division of Special Service -- Department of Agricultural Engineering, Agricultural Pests, and Agricultural Chemistry.

Department of Agronomy. The Department is concerned primarily with corn, cotton, rice, sorghum, beans, and sesame. A small amount of work has been initiated on pasture, with the introduction and trials of new grass species. No work is underway on sugar cane. Some breeding work is being carried out on both corn and cotton. This Department has perhaps one of the most active programs in the station. Part of the salary of one of the top technicians is paid by the Rockefeller Foundation as part of a regional program on basic foodstuffs.

Almost all of the research is done at La Calera, although the Department is cooperating with the Agricultural Extension Service, FAO and the National Bank in an extensive demonstration program with corn. Approximately 400 plots have been established throughout the country on which different fertilizer treatments are being tested on improved corn varieties.

Other experiments underway include planting densities, weed control, biological control of insect pests, planting dates, and fertilizer trials. No irrigation research is underway in the country, although several large irrigation projects have recently been installed.

Research so far on corn, under a Central American corn improvement program spearheaded by the Rockefeller Foundation, has indicated that the average corn yield for Nicaragua of 13 quintels per manzana could easily be tripled with the use of better technology. Although much of the necessary information is now available an unsufficient effort has been made to get the information to the farmers. Sorghum also shows promise in many of the drier areas of the country.

Department of Seed Certification. Although this Department is budgeted separately from Agronomy, the two operations are coordinated under a single head.

The seed laboratory runs germination tests for both farmers and for commercial sources of seed. Apparently, there is need for a good seed law since at the present time there is no real control over the sale of bad seed. The only recourse for buyers who have not received a fair deal is through the courts, which may be quite time-consuming and costly. Although a seed law is now on the books, very little implementation or enforcement exists.

The Station is producing all of the foundation seed and some certified seed of corn, sorghum and cotton. The value of certified seed sales by the Experiment Station amounts to some C\$90,000 annually. Although all cotton seed is now privately produced or imported, only one private farmer is producing corn seed. The Experiment Station supervises all private fields which are producing certified seed. The Station's role is one of encouragement to the private growers so that they may eventually produce all of the seed that is needed by the country. Income derived from certified seed by the Experiment Station may be used to support activities of the Station upon submission of a budget request to the Minister of Finance.

Department of Horticulture. This Department is apparently weak and is not engaged in any intensive research programs. The coffee program, which formerly was a part of this Department, has been transferred to the National Coffee Institute. The personnel and budget remained with the Ministry at the time of transfer. Two technicians have also been temporarily transferred to the Agronomy Department to assist the program of corn demonstration plots. Primary work of the Department is at La Calera, but 59 manzanas of land are also available in the highlands at Campos Azules, which the Experiment Station retained when land at Masatepe was turned over to the Coffee Institute.

Principle efforts of the Department are the propagation of plants and some variety trials. Several thousand fruit trees are propagated annually. Most are sold to farmers although, quite frequently, requests come through political channels to make plants available at no charge.

Variety trials are underway on avocados, mangoes, citrus, Spondias (sp.) and grapes. A small amount of work is also underway on vegetables and imported ornamentals, many of which could be produced locally.

Department of Soils. The primary effort is on soil survey, and little or no work is being done at present in soil fertility or soil testing. Two soil survey parties are in the field at the present time doing semi-detailed soil surveys at a scale of 1:50,000. Two maps have been published so far. Four more sheets have been completed but no funds are available to publish the reports. In 1960 a soil survey was published on the Rivas Irrigation Project.

The Department also does land use studies for private firms, which result in recommendations for irrigation and soil conservation projects. About 10 of these are done a year and so far more than 100 have been completed. There is much more demand for this type of service than can be met by the limited resources of the Department.

Plans are underway to transfer the activities of the Soils Department to a national office of natural resources which will be under the National Planning Office. The Department, though still paid by the Ministry, will cooperate with several other government agencies in making a nationwide survey of natural resources.

Department of Animal Husbandry. This unit is concerned with cattle, swine and poultry. Very little research is being done at present in this entire section. Animal husbandry research appears to suffer more than most departments from political interference and lack of continuity in the programs, primarily because it is difficult to maintain herds or research material over a long period of time. For instance, the cattle herd has been sold three different times in recent years--each time as the result of a decision by the incumbent Minister in office at the time. Two years ago, when the herd was sold off, only one heifer was maintained--one which was hidden at another location. The same problem has apparently occurred in the swine program. The political pressures are so great to sell or give away new progeny, that it is practically impossible to keep a large enough supply on hand for extensive research.

The poultry program is mainly concerned with determining the production costs of layers and broilers. In addition, some experiments are under way in the use of local feedstuffs in feeding programs.

The swine program includes groups of Poland China and Duroc Jersey breeding stock. A feeding experiment is underway on the use of cotton-seed meal.

Only 34 cows are now available for experimentation. A small number of breeding experiments are underway using artificial insemination. Although some cattle are available at the El Recreo Station, these are under the supervision of the Extension Service and are not being used for research. Good personnel relations have been maintained in INFONAC and some cooperation is underway since they have adequate herds.

No pasture or forage work is done in this section since this is the responsibility of the Agronomy Department. However, some trials are being run to test the value of Jaragua grass in open-pit silos. The small amount of available land at La Calera further limits research work with livestock.

Department of Veterinary Science. The staff consists of one veterinarian, one technician and one assistant. Some diagnosis of animal diseases is done here and milk is frequently checked. Previously, the University of Pennsylvania had a mission stationed at La Calera which studied Leptospirosis for three years. This team provided the Station with some good equipment and continues to provide some diagnostic help at Pennsylvania.

Department of Agricultural Engineering. This unit is primarily a service department, and is headed by a civil engineer. Upon the request of a farmer, they provide help in laying out an irrigation system or developing a soil conservation plan. In many cases, they actually provide the labor to do the work, such as building terraces, putting in drainage systems, etc. Many times the Department supervises construction and design while the farmers provide the labor. One of the former Ministers of Agriculture actually had this department involved in designing and building bridges and schoolhouses. The present function of this Department appears to lean heavily to extension activities rather than research.

Department of Agricultural Pests. At present the staff consists of a head, 1 entomologist, and 2 plant pathologists. Three other technicians are out of the country taking advanced degrees, and will be committed to work two years for the Department when they return. Much of the work of the Department is concerned with the identification of diseases and insects--about 30 insects and diseased plant material are submitted per month. No work is being done on nematodes. Some research is under way on the biological control of cotton pests, selection of bean varieties resistant to disease, and insecticide tests in corn.

Department of Agricultural Chemistry. Main emphasis of this Department is on analytical work in soil, water, feed and insecticides. One chemist

is in charge and has a staff of three technicians. Some 957 soil samples were analyzed last year by means of "quick tests". Some 270 insecticides are analyzed per year with a charge of C\$35 per ingredient. Plans are also underway to analyze 250 feed samples per year for fats, proteins, and crude fibers at an anticipated charge of 75 to 100 cordobas/sample. Eventually, it is hoped that a commercial laboratory in Managua will take over this latter service. Some water samples are also analyzed for irrigation and drinking purposes at no charge.

Apparently, one of the big problems in the chemistry laboratory, as well as throughout the rest of the Ministry, is the long time required to have a purchase order processed. Requisitions have to be processed through the Ministry of Hacienda, and are often held up a month and a half. The autonomous and semi-autonomous agencies do not appear to have this problem.

El Recreo. This former experiment station was founded in 1943 near Bluefields on the Atlantic Coast. The U. S. Government assisted in its establishment, as well as the nearby Kukra Hill station. These stations worked on the development of crops for the high rainfall region of the Atlantic coastal lowlands. Principal areas of investigation were oil palm, rubber, cacao, forestry and livestock. The station is four hours by car from Managua on the Rama Road. In addition, it has an airstrip and is connected by means of a navigable river to the port of Bluefields.

The station is now being well maintained by the Extension Service and no active projects are underway. The man in charge has done an excellent job of preserving the facilities in good order. The annual budget is about C\$300,000. Approximately 1156 hectares of land are in the Station, of which about 200 are devoted to agriculture. The livestock herd contains 70 head which are grazed on 180 hectares of pasture. The herd is primarily 1/2 and 3/4 Brown Swiss blood; approximately 30 of these are milked regularly.

The physical plant at El Recreo is quite impressive and is expensive to maintain--especially if the station is not playing an active role. Buildings include an administration building with laboratories, a large machinery shop, 13 residences, a guest house, stable, nursery and miscellaneous farm buildings. Approximately 38 employees are in residence. Employees are given a house, water and lights in addition to their salary.

El Recreo could play an important role in development plans for the Atlantic coastal plain. It is located on the southern margin of the large agricultural colony which is now being planned by IAN. In addition, it is typical of a large region on the eastern side of Nicaragua. The physical plant is well laid out and adequate land is available for experimentation. Investigations could be initiated at El Recreo at little more cost than is now being used to maintain the Station. The most important research problems that could be studied by the Station are those relating to the livestock industry. The Station could also assume a useful role in applied research on food crops.

National Agricultural School (ENAG)

The National School of Agriculture is the only institution of higher agricultural education in Nicaragua. It was founded in 1929 as a branch of the Ministry of Agriculture. At that time, it was located in Chinandega and offered high school degrees in agriculture. The School was transferred to its present site at "La Calera" in 1951, where it adjoins the Experiment Station. The School does not belong to the National University of Nicaragua, though all courses are university level. The School gives diplomas of graduation; the degree of "Ingeniero Agronomo" is awarded by the President of the Republic, the same procedure which is followed by the National University. The School was granted semi-autonomous Status in 1964, when the new Ley organica was passed. Total budget for the School in 1965 is 1,112,570 cordobas.

The School has 21 hectares of land which are used for teaching, demonstration and commercial production. The buildings are valued at three million cordobas. Most of the activities are housed in three main buildings--a dormitory, a dining room and kitchen, and the main building which houses the offices, class rooms, laboratorios and library. Laboratories are available for the teaching of biology, botany, physics, chemistry, agricultural engineering, and veterinary medicine. The library houses 6000 volumes and 14 subscriptions of periodical magazines. Most text books are in English.

The faculty of the School at present is made up of 24 teachers although the number varies greatly from semester to semester. Of these, three are full-time, two are half-time, and the rest work part-time. All faculty members have the title of Ingeniero Agronomo, or its equivalent, and some have higher degrees. Six faculty members are now outside of the country receiving advanced training at other institutions. The full-time professors get an equivalent salary of C\$3600/month. However, most faculty members are paid by the hour for teaching. Hourly rates are the equivalent of those offered at the National University and are C\$30/period for lecturing and C\$20/period for laboratory. The periods are 45 minutes in length.

The present curriculum is 10 semesters long or five years. Semesters start in June and November. All applicants must be high school graduates and have to take an admission test. Approximately 80 percent of the students that apply are admitted. The number of students who drop out the first year is high, and at times may be as much as 70 percent. The following table shows the number of students in various categories for the period 1960-1964.

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
Number of applicants	72	86	59	57	72
Number admitted	63	67	49	52	52
Number who entered	55	62	42	49	51
Total number of students	119	127	111	119	127
Number in fifth year	10	14	19	12	18

Since the School started its University-level program in 1956, 78 students have completed the course work. However, only 23 of these were awarded the Ingeniero Agronomo degree, the remainder not completing the required thesis. Adequate supervision is not available to enable all students to carry out research projects. Nevertheless, local job opportunities are approximately the same for the two groups. A problem arises when a student wants to take advanced work outside of the country, in which case the students who are not awarded the diploma are usually not accepted as regular students. Approximately half of the previous graduates are now working for the government.

The government provides scholarships for all students who make a grade of 80 or above. This represents about half of the total. Students who make grades between 70 and 80 must pay 150 cordobas per month. Students who make grades between 66 and 70 (66 is the minimum grade for passing) must pay 225 cordobas per month. The total cost for maintaining a student for one month is estimated to be almost 1000 cordobas.

Under the Ley Organica of 1964, the School has a semi-autonomous status within the Ministry of Agriculture. The School's funds are included within the budget of the Ministry. However, the School is guided by a Board of Directors which is composed of the Director, three professors and one student. These are concerned with routine administrative problems. The Board of Directors is elected by the General Assembly which is composed of all faculty members, one student, representatives from the Ministry of Agriculture, and a representative of the professional agriculturists. The Assembly meets once a year. It has the responsibility of recommending three people to the President of Nicaragua, who appoints one of them as a Director. The Director has a tenure of four years.

An investigating committee has recommended that the location of the School should be changed. At present, it immediately adjoins the international airport of Las Mercedes. Planned expansion of the airport to accommodate jet airplanes will use some of the property of the School, and interrupt the road connecting it to the Experiment Station of La Calera. Noise produced by air traffic interferes with lectures, and vibrations from planes disturb sensitive laboratory equipment. The location of the Experiment Station will probably be changed at the same time and the two moved together to a new site.

The School has a very dedicated administration, and quite impressive progress has been made in the last two years. However, several serious problems still exist. The large number of students which are eliminated in the first year creates an inefficient use of the facilities. The small number of full-time professors, or staff that make a career of University work, contributes to discontinuity in the teaching programs. Furthermore, part-time teachers often find that their outside responsibilities conflict with their teaching load to the detriment of the latter. The small budget of the School prevents it from obtaining adequate equipment for university-level training. And, finally, the only source of Ingeniero Agronomos in a country that is primarily agricultural,

is far behind in providing the ever increasing numbers of graduates who are needed to increase the productivity and diversification of agriculture.

The Agricultural Extension Service (SEA)

The Agricultural Extension Service was organized in 1951 with assistance from the joint US-Nicaragua Agricultural Service (STAN). SEA is in many respects modeled after Extension work in the United States with programs in agriculture and home economics for both youth (4-S) and adults.

The program has a director, two regional supervisors, 7 specialists (community organization, plant breeding, livestock, communications, horticulture and home economics(2)) and 17 field offices. The staffing pattern for the field offices normally involves 1 extension leader or agent, 1 assistant agent (4-S) and 1 home demonstration agent. Some offices do not have the full complement of personnel and a few have an additional assistant agent. Altogether, there are some 11 administrative and technical personnel in the central office, and 46 in the field offices. The two home economic specialists are located in the field rather than the central office.

Among the extension agents, specialists, supervisory and administrative personnel, 7 have an Ingeniero Agronomo degree, and 20 have had training in agricultural technical schools. Among the assistant agents and home demonstration agents, 5 have Ingeniero Agronomo degrees, 9 are graduates of agricultural technical schools, and 9 have the equivalent of a high school degree. Most of the home demonstration agents are trained in "normal" schools (for public school teachers).

No one in the Service at the present time has obtained formal training outside Nicaragua.

The budget of SEA in 1965 is 2,646,826 cordobas. This represents approximately 23 percent of the total budget of the Ministry of Agriculture (exclusive of that assigned to the Agrarian Institute). Approximately 80 percent of the funds of SEA are allocated to salaries and wages.

Following is an average monthly salary scale for different categories of Extension personnel.

Director	C\$4,250
General Supervisor	2,700
Supervisor	2,500
Specialist	2,100
Agents	2,000
Home Demonstration Agents	1,100
Assistant Agents	1,500

The Extension Director estimates that approximately 20 percent of the area of the country is served by Extension, and that approximately 15 percent of the population is influenced directly by Extension, with 30 percent influenced indirectly. He estimates that each agency or field office can serve about 400 families. ^{1/} The Director of SEA estimates that some 40 field offices would be needed to adequately serve the country.

There are some 32 4-S clubs in the country, with a total membership of 730.

The overall plan of organization and operational philosophy of SEA are, in our judgment, basically sound. However, SEA is confronted with many serious problems which greatly limit its effectiveness:

- (1) The number of field offices and field personnel is far too small to provide essential educational assistance to farm families. Furthermore, the level of training of field personnel is generally far below what is needed.
- (2) The "specialist" staff is weak both in numbers and training. Indeed, few have received any advanced specialized education in their particular field. Furthermore, there is no one to provide program leadership for the major agricultural enterprises such as corn, cotton coffee, sugarcane, etc.
- (3) Inadequate salaries result in serious morale problems and a steady loss of the better personnel. The annual turnover of personnel within SEA is approximately 40 percent. This problem is so great at the present time that two of the extension field offices are completely unstaffed and closed. Many other positions remain vacant. The lack of continuity of staff has also resulted in a sharp decline in size and effectiveness of the 4-S program. For example, there are only 2/3 as many clubs now as compared to a few years ago.
- (4) The program of SEA is also suffering greatly from lack of adequate vehicles and for support funds generally. Except for five vehicles made available through AID this year, all of the vehicles in Extension are 10 years old or older. Some are surplus military vehicles--many are virtually useless. Furthermore, travel funds are sorely limited. An extension agent is allotted two gallons of gas daily for official travel. The expense allowance for a specialist while in the field is about C\$25 daily. Inservice training programs are extremely limited by lack of funds.
- (5) Political interference in the appointment of personnel is another factor contributing to low morale and reduced effectiveness of SEA. Within the past two years SEA has had to

^{1/} At the last census, there were some 140,000 rural families in Nicaragua. If each agency served 400 families, the present number of field offices could serve less than 5 percent of the total number of rural families.

hire eight agents as the result of political "pressure". These agents are essentially unproductive and apparently cannot be removed.

Most of the above problems are related directly to inadequate financing, and must be corrected if SEA is to make its vitally-needed contributions to the further development of Nicaraguan agriculture and rural people generally.

Division of Agricultural Economics

The principal mission of the Economics Division has been the compilation of agricultural statistics. Formerly, the Division was located at La Calera, but two and a half years ago it was transferred to the Ministry in Managua. The budget is reported under "administration" and was 283,500 cordobas for 1965. At present, the division has a staff of three technicians. The division head is on a leave-of-absence to obtain a college degree in the United States. After his return one of the other staff members will leave for additional training.

The collection of agricultural statistics is not well coordinated in Nicaragua. At least four different agencies are involved in obtaining their own sets of data, and there is little agreement among them. The Ministry cooperates with the Direccion General de Estadistica in collecting data. However, the agricultural statistics are considered to be among the best for the region.

Unfortunately, the Ministry is devoting little attention to studies on marketing, production costs, and planning. Any proposed reorganization should place strong emphasis on these topics.

Division of Natural Resources

The Division of Natural Resources is composed of the Departments of Forestry and of Fish and Wildlife. This division has considerable overlap with other ministries and many times the division of responsibilities are not clear-cut. For instance, the Ministry of Economy levies taxes on trees cut for lumber, the Ministry of Agriculture enforces the tax, and it is collected by the Ministry of Hacienda. Another case is the fish restocking program which is carried out individually by the Ministry of Economy as well as the Department of Fish and Wildlife of the Ministry of Agriculture.

The Department of Forestry was created in 1948. Forestry matters basically are the responsibility of MAG, but the Ministry of Economy is in charge of granting concessions for exploitation. In addition to policing contracts awarded by the Ministry of Economy, the Department also inventories lumber exports. Laws have been established to prevent harmful deforestation and the unwise use of fire, but no enforcement is practiced. Fifteen people are employed in Forestry, including 2 technicians and 11 inspectors in various departments of the Republic.

The Department of Fish and Wildlife has a staff of four inspectors, including one working on lobsters at Corn Island. Primary responsibilities of the Department are to supervise the exportation of game, control commercial and sport fishing, and enforce laws relating to seasons and catch. The Department imported and distributed the fish, Tilapia, in 1959, which since then has become important in the country.

Division of Agriculture

This section of agriculture is two years old. It is mainly responsible for services and pest control. It consists of the following three sections:

1. Plant Quarantine.
2. Pest Control
3. Registration and Controls

The budget for these services for 1965 is C\$1,075,020. Approximately 67 percent of the budget is for salaries--probably the lowest proportion of any unit within the Ministry.

Plant Quarantine. Inspectors watch all international ports-of-entry to prevent the introduction of new pests or diseases. Approximately 14 technicians are employed as inspectors. An internal quarantine is also operated within the country to prevent the further spread of the Mediterranean Fruit Fly. This additional service employs eight assistants.

Pest Control. This unit was first organized to control locusts. Primary attention is now being given to the Mediterranean Fruit Fly. A cooperative project with OIRSA is releasing sterile flies to eliminate this pest. In addition, technical assistance is provided to farmers for the control of rats, rice birds, and other pests.

Registration and Controls. This unit controls the importation and use of agricultural chemicals. Importers pay a fee of C\$175 for each product that is imported. The annual renewal fee is an additional C\$140. This money is paid directly to the national treasury and is not available for rebudgeting to Agriculture. However, a change in the rules has been requested to allow the Ministry of Agriculture to use these funds.

Fines for the use of unacceptable practices in the production of cotton net about C\$100,000 a year which is paid directly to the national treasury. Farmers are penalized for planting cotton before or after the assigned dates. In addition, a farmer may be penalized for not properly destroying cotton plants after harvest. Cotton gins are also fined if cotton is not processed or stored properly.

Analyses are made periodically of insecticide formulas to check the composition to see if it conforms with the law. Approximately C\$18,000 are collected annually from fees which are used to repay a bank loan for the cost of the analytical equipment. At present, the analytical work is done in La Calera but efforts are being made to move the

laboratory into town. No law exists in Nicaragua to control the composition of chemical fertilizers. However, with the recent establishment of two mixing plants, a law is now being written. Enforcement of this law will probably be a responsibility of this department.

Division of Livestock

The Livestock Division is divided into the four following departments:

1. Veterinary Services and Animal Health
2. Artificial Insemination
3. Registry of Veterinary Products
4. Meat Inspection

The budget for 1965 was C\$989,400. The Veterinary Services Department includes one chief and five veterinarians. However, only two of the veterinarian positions are filled since the salary of C\$2500/month is not competitive with that offered by other agencies. The veterinarians are stationed in the Extension Agencies of some of the important livestock areas. They provide free diagnosis and service to farmers requesting it. Samples for diagnosis are sent to the laboratory at La Calera. The veterinarians also see that animal health laws are being observed and watch ports-of-entry for diseases. They certify the health of exported animals and provide import licenses for animal products.

Artificial Insemination. This project was first started by MAG under the STAN program. In recent years, participation by MAG has gradually decreased as more and more of the responsibility has been transferred to the Cattlemen's Association and private participants. The Army has also played an important role in the development of this service. This Department in MAG has recently given short courses to encourage private initiative in this field. It is possible that the program will finally be phased out of the Ministry almost completely. At present, one veterinarian and three technicians are working in the Department.

Registry of Veterinary Products. The department is in charge of registering imported veterinary medicines. An importer must supply three samples of a new product and the certificate of origin. The cost of registration is C\$25 for each new product. The money is paid directly to the national treasury. So far, none of this money has been available for rebudgeting to Agriculture. However, efforts are being made to use the money in the Ministry of Agriculture. At present, the department has two technicians.

Meat Inspection. This department has been in operation for a year and a half. One veterinarian is assigned to each of the country's three slaughter houses. A fourth veterinarian is Chief Inspector and coordinates the work.

Other Agriculturally Related Institutions

The Nicaraguan government has sponsored several agencies, many of them quite good, which are also involved in various aspects of agricultural development. INFONAC, for instance, is highly regarded throughout Central America for the role it has played in the development of agriculture in Nicaragua. Nicaragua's financial leadership and institutions have also been highly regarded within Central America. These various institutions, although contributing important help to the agricultural sector, have further weakened an ineffectual Ministry of Agriculture by assuming many of the same responsibilities. Some of the more important organizations will be described in this section.

National Economic Council

The Council consists of representatives of regular government ministries, including the Minister of Agriculture and autonomous agencies. Sessions are chaired by the Minister of Economy. The revised law of 1963 makes the Council advisor to the President on national economic policy and the Council has primary responsibility in setting the basic guidelines for planning the economic and social development of Nicaragua and the coordination of internal assistance. Therefore, the structural reorganization of the Ministry of Agriculture would be considered by the Council in its regular sessions. The Council is composed of representatives of all major areas of activities in the government, as such, it has wide authority but as often happens, progress in achieving an integrated coordinated government attack on basic problems appears to be slow. Progress in agriculture is no exception to this generality. However, the Council has an important voice in national affairs.

National Planning Office

A national planning mechanism was established in 1962 with the creation of the National Planning Office. The latter functions as an arm of the Council. Among its functions, the National Planning Office has prepared a formal economic and social development plan for Nicaragua for the quinquennial period 1965-69. The plan was submitted for the consideration of the National Economic Council, and after due deliberation, it was sent to the President with some recommendations concerning its implementation, and then given executive approval.

The Planning Office was assisted by the Joint Programming Mission for Central America in the preparation of an economic diagnosis which led to the form and content of the final Five-Year Plan. The diagnosis and the plan have now been distributed to all Governmental Agencies and to the international organization who are interested in the subject. With the publication of the plan the private sector of the country will be invited to submit its opinions and recommendations.

Since the idea of national planning is new, much of the plans and budget preparation within the ministries and autonomous agencies follow

traditional patterns. Few ministries and autonomous agencies have a formal mechanism for planning.

The Office serves as technical secretariat to the National Economic Council and has direct responsibility in the formulation of development plans and the evaluation of results. The Office will also be in charge of coordinating a proposed cadastral loan of 4.7 million dollars when it is activated.

An Agricultural Committee has been appointed with responsibility for the implementation of the parts of the five-year plan dealing with agriculture. The Minister of Agriculture, the Minister of Economy and the Presidents or Executives of the National Bank, Agrarian Institute and INCEI, will serve on the Agricultural Committee; as well as representation from the private sector.

Central Bank

The Central Bank plays an important role in the development of agriculture in Nicaragua. The Bank works cooperatively with other agencies of the government and in many respects has strongly encouraged or actively led developments concerned with improving the agricultural production in the country. Recently, the Bank has offered funds for the development of regional experiment stations, since it was felt that this had become an important limiting factor in several developmental programs. The establishment of experiment stations was suggested as necessary since several of the governmental agencies need this type of information. Ultimate responsibility for the experiment stations was undecided.

The Central Bank also helped sponsor the visit of Italconsult, an Argentina consulting firm, to survey the livestock industry of Nicaragua. Although no major recommendations grew out of this visit that were not already known to most of the agricultural leaders in Nicaragua, the visit was important in the encouragement of interest in problems of this sector, and as a vehicle to bring interested Nicaraguans together for positive discussions on the problem.

Commercial or industrial credit is more attractive than agricultural credit to a bank. The Central Bank has offered agricultural credit but so far has not pushed strongly in this direction. They do not believe that the necessary institutions and government support are available for unlimited agricultural credit.

Regulations of the Central Bank in 1964 encouraged commercial bank credit for agriculture. During that year loans for agriculture and livestock increased 41.8 percent.

The general view of the Central Bank is that the agricultural sector has not responded satisfactorily to financial support. Credit, so far, has not helped the small farmer very much, partly because disbursement has not been well organized. An uneasy feeling exists concerning agricultural development because export crops are very vulnerable and a lack of internal organization is apparent, especially in the areas linking the Ministry of Agriculture to developmental activities.

A strong need is apparent for the encouragement of crop diversification through several possible channels. The financial institutions have been unable to take leadership in the development of staple crops because of the high risk factor involved.

The Bank is most interested in the improvement of organization and coordination between agricultural agencies, according to its President. He says that too often in the past agencies have been more interested in obtaining self-recognition for their activities rather than their service to agriculture and to the National Government.

National Bank

The National Bank plays a primary role in stimulating the development of Nicaraguan agriculture through the provision of long and short-term credit to the agricultural sector. Recently, a rural credit program for small farmers was started with the help of a 2.5 million dollar loan from the Inter-American Development Bank. Primary emphasis is on domestic food crops. In 1965, approximately 10,279 families of limited circumstances were reached with these loans. It is anticipated that 18,000 families will receive loans in 1966.

The Bank emphasizes the fact that they are providing "rural" credit, not "supervised" credit. They indicate that they do not have the number of technicians for supervision which would be needed to ensure that a farmer is carrying out a farm plan under the terms of the loan. However, the Bank is hiring agriculturally trained personnel who should visit the borrower four or five times a year. At present, 70 technicians are involved in the rural credit program. Recruiting is continuing, and efforts are being made to hire 25 more technicians for the coming year from the Escuela Agricola Panamericana as well as other schools. Technicians are paid a minimum of C\$1750 and a maximum of C\$4000 per month. Nine veterinarians are presently employed at C\$4000 each.

A special training program for technicians of the National Bank is being planned under the sponsorship of the AID-USDA/PASA team.

Maximum interest rate for agricultural loans other than cotton is 6 percent plus one percent for handling. (The Bank claims a 98 percent recovery on rural credit loans).

In addition to technical help which is available from the agencies of the bank scattered around the country, six supervisory technicians work from the central office to establish levels of yields, fertilizers, and chemicals. There is no really good single source for this type of information in the country. The Bank is cooperating with FAO and MAG in the establishment of corn demonstration plots around the country. They also cooperate with the Experiment Station at La Calera in the production of hybrid seed.

The Bank proposes to have a total of 41 offices by the end of 1965. Twenty-five of these offices will be field offices and the rest banking offices. So far all the rural credit agencies have been placed on the Pacific side of the country since land tenure is much more uncertain on the Atlantic lowlands. Some supervision is provided for use of the loan and for scheduling repayments. However, no steps are made to carry out a farm plan.

Agrarian Institute (IAN)

The Agrarian Institute was created on July 1, 1964, following the passage of the Agrarian Reform Law the previous year. The Board of Directors includes the President of the Agrarian Institute, Minister of Agriculture, Manager of the National Bank, a representative of each of the colonies, agricultural associations of the country, and the minority party. The President of the Institute and the last three Board Members are appointed by the Nicaraguan President.

The Institute inherited 10 colonies from the outset which included approximately 1133 families on an area of some 15,500 manzanas, of which about 1,300 are cultivated. The colonies were already established and are usually regarded as political expedients rather than viable economic units.

During 1964-65 the Institute acquired 39,701 additional acres on which 710 families are being organized in eight colonies. In addition a large new settlement of 300,000 hectares is being initiated along the new Rama road on the Atlantic coast. The total cost of this latter project is estimated to be between 40 and 50 million dollars. A C\$300,000 loan is being requested to finance studies for the project.

The cultivated land in colonies in 1964-65 was 3,454 hectares. The total return on the crops was C\$6.3 million. The 36.2 percent of the land which was planted in cotton yielded 59.8 percent of the total cash returns. On the other hand, 46.1 percent of the area was planted in corn which earned 31.3 percent of the total cash income. The average cotton yield in the colonies during the 1964-65 season was 2,279 kg/ha compared to the national average of 2,431 kg/ha. However, the average corn yield in the colonies of 1,967 kg/ha was much higher than the national average of 826 kg/ha.

The Agrarian Reform Law appears to be rather sensible and free of any extremism. Part of the Law provides for the clearing of land titles which has become a problem in the provision of bank loans to small farmers. Free title to 50 hectares of unused government-owned land is granted to farmers who have occupied the land for at least one year prior to the enactment of the Agrarian Reform Law. Land titles will also be granted to colonists after they have paid for 25 percent of the land. A total period of 15 years plus two years grace is allowed the colonists to pay for their property.

IAN is attempting to provide technical and financial assistance to the colonists. At least 75 percent of the colonies are serviced by two agronomists each. These agronomists are under the supervision of the agricultural section of IAN. A soils laboratory, supervised by a technician with an M.S. from Wisconsin, provides analysis of farmers' samples.

Credit is provided to colonists by the National Bank through IAN. IAN presents the request for credit in behalf of the colonists to the National Bank. The credit is then administered by IAN. Credit is only available to those farmers who cannot obtain it from commercial sources. Commercial banks are unable to provide credit for operators of untitled lands unless a co-signer is available.

IAN is attempting to start a program of supervised credit for families that do not have a land title. Approximately 50,000 families, out of 149,000 rural families in Nicaragua, will be eligible for such a program. The GON may have some money budgeted next year to cover bad loans. Under a program of supervised credit, IAN anticipates that a region of 150 families will need 3 technicians, or approximately 1 technician per 50 families. One home economist will work with two agricultural technicians. IAN anticipates that the supervised credit program will at first be limited to colonists. After the needs of colonists have been fulfilled, the program will be expanded to include other parts of the country not included in agrarian colonies.

The budget for IAN in 1965 was \$714,285, and an increase is anticipated in the 1966 budget. The Director of IAN has also anticipated a need of 25 more technicians for next year to service the colonies now in existence.

The two programs to which IAN has assigned priority is the establishment of more land titles and supervised credit. One obstacle to the adequate recognition of land titles is the lack of an adequate cadastral survey. Many national lands would probably be available for colonization except that the exact boundaries are unknown. Until a thorough cadastral survey is undertaken, national planning in the provision of land titles and colonization will be seriously hindered. In some cases, IAN is also working with Indian villages to assign them land which can be managed on a cooperative basis.

The proposed colony of 300,000 hectares on the Rama road is a tremendous undertaking in a difficult environment. The Atlantic Coast so far has been sparsely settled and has been important mainly for export crops and marketable timber. A large colonization project there should be accompanied by ample technical assistance and research. The MAG experiment station at El Recreo is in one part of the colonization area and has ample physical facilities, though much underused. The Station could play an important role in opening up the Atlantic lowlands. IAN may use some of the physical facilities to headquarter staff members involved in the project. Food crops which could be grown by colonists in the area are: rice, cassava, taro, and yams, as well as livestock.

INFONAC (Instituto de Fomento Nacional)

INFONAC was initiated in 1954 to help diversify national production and to accelerate the economic development of Nicaragua. The Institution is autonomous with its own financial resources but is also subsidized by the GON with funds from the national budget. It generally initiates long-term investment and risk capital programs which private enterprise normally would not consider. Close cooperation is encouraged with government agencies as well as private agencies.

Half of INFONAC's resources have been channeled into agriculture, including such projects as livestock repopulation, banana development, reforestation, tobacco experimentation and regional surveys. Loans are generally made on a medium or long-term basis for the acquisition of fixed capital in the development of new enterprises.

One of the major projects in the agricultural sector is a program to improve beef quality which has become the basis of a major export. A four-year program is underway to increase the cattle population in Nicaragua to 2,100,000 by 1967, and to double beef exports to fifteen million dollars. The Matadero Modelo one of the most modern slaughterhouses and packing plants in the Hemisphere, was started by INFONAC and is now valued at US\$3,000,000. Now INFONAC matches the number of shares owned by the Cattleman's Association and the balance are owned by the Ifagan Co. The plant has a capacity of 350 head per day and provides a ready market and a stable price for beef throughout the year.

The cattle development program is encouraged by a unique arrangement between INFONAC and local farmers. INFONAC's Santa Elena farm is used to produce purebred bulls. Herds of one purebred bull and thirty cows of more than half pure blood are made available to pre-inspected farms. The farmer returns half of his calf crop to INFONAC. These calves are then used to expand the program to new farms. Approximately 5000 cows have been distributed in this way to more than 180 farms. One inspector is assigned to each thirty herds.

Banana production in the Chinandega area is currently receiving attention in an effort to diversify crop production. Approximately 2000 hectares have been planted in bananas and it is hoped that this will be expanded to a total of 4000 hectares. Exports of bananas in 1964 were 1.1 million boxes of 40 pounds each. Blowdowns in 1965 cut this production to half. Much of the planted area, formerly planted with Gros Michel, is now being replanted with the more wind resistant Cocos and Valerie varieties. The bananas are marketed through the United Fruit Company. Twenty-four farms are involved.

The development of a Havana type tobacco industry is also being pushed by INFONAC. Approximately 100 hectares are planted at present. Farmers contribute the land and 25 percent of the expenses. INFONAC contributes 75 percent of the expenses and splits profits 50-50 with the farmer.

Smaller projects are also being carried out on kenaf, swine, honey, and poultry. In addition, \$1.25 million have been obtained from the United

Nations Special Fund to conduct a pre-investment survey of the north-eastern part of Nicaragua. The Inter-American Development Bank provided a \$2.33 million loan in 1964 for irrigation, cattle expansion and other agricultural projects.

Undoubtedly, INFONAC has played an important role in the recent growth of Nicaraguan agriculture. An early effort in grain storage and price stabilization led to the development of INCEI, an autonomous agency which is discussed in another section. INFONAC conducted the initial survey for the Rivas Irrigation Project. It also has 150,000 acres of pine stumps under protection which will be used for the production of turpentine.

INFONAC has accumulated some of the prime technical men in agriculture in the country. Approximately 15 technicians are employed in crop diversification and irrigation; approximately 15 more are employed in the livestock section. Several economists in INFONAC are also working on agriculture. Employees work a 40-hour week from 8 to 12 and 2 to 6, Monday through Friday.

INCEI (Institute of Foreign and Domestic Commerce)

INCEI is an autonomous agency which was established in 1960 in an effort to stabilize the price of food grains. It is an outgrowth of the National Bank of Nicaragua (in the past known as Compania Mercantil de Ultramar) and of an INFONAC project which used large storage facilities so that grain could be bought during periods of plenty and low prices, and sold during periods of scarcity. INCEI purchases grains at a fixed floor price. These grains are then resold to the public during periods when prices normally are higher, at the original floor price plus storage charges. INCEI may also import grains if local stocks are insufficient or prohibit the export of commodities which are considered scarce. The government may buy domestic produce through INCEI when it feels buyers are not offering fair prices.

The original storage facilities were built in Managua with a loan from the I.B.R.D. Recently, the Export-Import Bank has loaned INCEI 1.25 million dollars to build additional storage facilities totaling 14,750 metric tons in 5 producing areas. At the present time, prices are not completely stabilized but the provision of new storage facilities will help INCEI to meet its goals.

INCEI many times acts as the importer of improved varieties of seed to be planted by the farmers. Several private firms and the Experiment Station at La Calera are the principal local suppliers of certified seed. Most varietal recommendations come from the Ministry of Agriculture.

INCEI has no agricultural technicians working for them at present. However, five Ingenieros Agronomos will be hired to run the new storage facilities. INCEI will probably start a technical department, composed primarily of economists and teachers of short courses. In this, they will be helped by other agencies.

An anticipated change in the law will allow INCEI to accumulate reserves up to 50 percent of the total funds. This will allow more elasticity in financing.

INCEI has often been criticized in the past for setting its price support levels too low. Some people also feel that INCEI should be involved in promotional as well as marketing aspects of price stabilization.

National Coffee Institute

The Institute was created in 1964 and at that time assumed control of the coffee program of MAG. The designated responsibilities are to improve production, promote international prestige of Nicaraguan coffee and provide information and technical assistance to the industry. The coffee experiment station and physical facilities of the Ministry at Masatepe was turned over to the Institute. The Ministry continues to maintain a few experimental plots nearby at Campos Azules.

The Masatepe station was started by STAN. Seventy-five varieties of coffee were planted there and a limited amount of experimental work was initiated. After STAN was discontinued, some of the work was carried on by private growers. Several of the varieties have been quite effective in increasing yields.

The Institute is now reproducing seed of some of the better varieties for dissemination. They are also making some recommendations on management practices, gathered from experience of other countries. Six technicians are now employed by the Institute and it is hoped that an additional 10 to 20 more will be added in the near future. Plans are underway for the development of a small vocational school at Masatepe to give a one-or two-year course to approximately 25 boys who will be trained as farm foremen and administrators. However, the Institute so far has not been greatly involved in research or the dissemination of information.

The Institute mainly acts as a coordinating organization for the production and marketing of coffee. All coffee farmers are members by law. Ten percent of the crop of each farmer is collected and kept in a warehouse to protect the international coffee quota and limit exports. A tax of 50 cents is assessed per bag of 60 kg. of coffee. Some of the funds are used by the government to pay expenses of officials in connection with coffee marketing. The residue supports the operation of the Institute.

Domestic consumption of coffee in Nicaragua is 50,000 bags per year. An estimated 63,000 bags of coffee were produced in excess of domestic consumption and the international quota in 1964-65. These surpluses are retained by the Institute. The approximate budget of the Institute was 1 million cordobas for the first year of operation. Technicians are paid C\$3500. The chief technician gets C\$4000 per month.

Cattlemen's Association

The Cattlemen's Association is an organization of livestock producers, headed by the ex-president of Nicaragua. The membership list is a reliable registry of Who's Who in the cattle business. Although the group is rather loosely knit, several of their activities have stimulated public interest in the value of livestock production to the country.

The Association has cooperated with INFONAC in the development of the chilled and frozen beef export industry, and are co-owners of the Matadero Modelo, mentioned in the section on INFONAC. It has also taken over a large part of the artificial insemination program from the Ministry of Agriculture, and in January will turn the business over to the farmers. At present, about 30,000 cows per year are being serviced by this program.

Agricultural Education in Nicaragua

The remarkable growth of Nicaraguan agriculture in recent years has placed a heavy demand on the number of people technically trained in agriculture at both the high school and college level. Most of the agricultural institutions are trying to expand the size of their technical staff at a time when few are available or few are being turned out by the local schools.

A report of a UNESCO mission (19) in July 1965 indicated that 163 technicians with bachelors degrees in agriculture are now working in Nicaragua. They predicted a need for 220 men with equivalent training by 1971 and 400 by 1975. CSUCA estimates a need of 201 more bachelors in agriculture during the period 1964-1974, or double the number of college-level technicians now working in agriculture.

The figure for the number of trained men with high school degrees that will be needed by 1975 is even larger. It is estimated that 4 pertitos agronomos are needed for each Ingeniero Agronomo, or a total of 1600 at that time. (21)

When one looks at the present facilities for training agricultural manpower in Nicaragua, it is realized that a tremendous effort will be needed to develop the capacity to turn out the required number of professional people in agriculture. Since the inception of its bachelor degree program in agriculture, the National Agricultural School has graduated 78 students, of which only 23 received the degree of Ingeniero Agronomo. Since 1945, 84 Nicaraguan students have graduated from the Escuela Agricola Panamericana in Honduras. No Nicaraguans have graduated so far from the I.I.C.A., Turrialba, though one student is now taking graduate work there in Forestry. The Catholic agricultural school at Rivas has graduated 116 students at the Perito Agronomo level since its founding in 1951. The remainder of the agricultural technicians now practicing in Nicaragua have obtained their training in other countries.

Ministry of Education

Formerly, the curriculum of public secondary schools provided for one course in the second year which was called "Practica de Agricultura y Ganaderia". The Ministry has now eliminated this program and is attempting to establish three secondary schools of agriculture in the important agricultural regions of the country. The actual sites have not yet been selected, but three teachers are receiving advanced training in France to carry out these programs.

The agricultural programs in the secondary schools will provide for 3 years of a general basic curriculum. The student will then take 2 more years of courses in agricultural subjects at the end of which he will receive a Bachiller in Ciencias Agricolas. He may then take an additional year to receive a title of Perito Agronomo, or possibly, Agronomo. The student in this last year will be able to major in plant or animal science.

The Ministry is also starting a program of including a few agricultural courses in some of the rural primary schools which will be called "Escuelas Granjas". Also, many of the usual courses will stress the use of agricultural examples. Previously, the Ministry has experimented with the use of school gardens in primary schools and feels that they have been a success.

The Ministry signs the diplomas awarded by the Catholic agricultural school at Rivas and by the National University. However, it has not been involved in the supervision of curricula in both cases, though an attempt is being made by the Ministry of Agriculture to modify the curriculum at the Rivas school to fit the national agricultural program more closely.

National University of Nicaragua

The University was founded in 1812 and since then has been headquartered in Leon where the administration and four faculties reside. In addition, three other faculties are located in Managua, and a section of the school of Education is in Jinotepe. The University has been autonomous since 1958. A planning Commission has been established within the University which is developing a long-range plan within the framework of the five-year plan of the National Economic Council. The Commission is also conducting a national campaign to ensure that 2% of the national budget is allocated each year for the operation of the University.

Approximately 2500 students now attend the University and anticipated enrollment for 1972 is 8,000. The average rate of increase for the last 12 years has been 7.4% annually. The predicted national need for graduates during the period 1963-1974 is 3,000. Approximately 130 students graduated during the last year. About 44% of the students drop out during the first year. The University hopes to increase the percentage of full-time professors from the present figure of 12% to 60% by 1972.

The Ley Organica of the University (18) in Article 8 states that a Faculty of Agriculture will be one of the eight component faculties. Article 9 indicates that this will consist of a School of Agriculture. One

objective of the University stated in Article 3 is to "contribute to the development of the national culture by organizing University Extension to benefit the people". Article 11 further says that the University will include an Extension Service and research institutes for the furtherance of culture and science. Article 185 of the University Statutes elaborates on the extension programs and says that they will be carried out by "institutes, research centers, courses, short courses, conferences and cultural missions".

The planning Commission of the University is studying the development of community extension programs which would include education, health, national resources, agriculture and development (economic surveys). Discussions have been initiated with the National School of Agriculture to involve them more completely in the University program. Regional research centers could possibly serve the University as well as the Ministry of Agriculture. (IAN is also studying the possibilities of community extension programs from regional centers).

International School of Agriculture of Nicaragua - Rivas.

The School was founded in 1951 by Dominican Fathers, and was approved officially by the Ministry of Education in 1960. The School is located in the town of Rivas, approximately 100 kms. south of Managua. Qualifications for admission to the school are a minimum age of 15 years, at least two years of secondary school, and the successful completion of an entrance examination. The School is the only vocational agricultural school in Nicaragua and awards a degree of Perito Agronomo after three years of course work. The curriculum is in the process of revision.

A total of 116 students have graduated from the school since its founding. Of these, approximately 96 have graduated since 1960. Nine full-time professors and four part-time professors teach in the school; approximately half are professional agriculturists. The student-teacher ratio is approximately 13 to 1.

An average of 130 students have been in attendance since 1960. Approximately 90 percent of these are boarders, and pay \$4,750 a year for all costs. Approximately two thirds of the students that apply for entrance are admitted. Fifty students are admitted the first year, and 76 percent of these on the average continue for at least a second year. The average cost per graduate is 2,034 dollars.

Physical facilities of the School are poor. A large, old house has been renovated to include classrooms, dormitories, dining-room, and kitchen. The School includes 44 hectares of land, of which 30 are in cultivation. The curriculum and facilities are generally considered inadequate to meet the national needs.

The National School of Agriculture appointed a Commission to study the curriculum and programs of the Rivas School in conformity with the charter of the Ministry of Agriculture. The 8-man Commission submitted a 97-page mimeographed report on March 10, 1965, of suggestions for curriculum revision and course content.

SUMMARY AND CONCLUSIONS

As a basis for our recommendations, we would like to emphasize the following points, some of which have been alluded to in earlier sections of this report:

- (1) The foundation of the Nicaraguan economy is--and for the foreseeable future, will be--agriculture. Two-thirds of the gainfully employed people are in the agricultural sector. However, average income of agricultural workers is extremely low and there is a pressing necessity to improve the standard of living of this sector of living. Agriculture contributes more to the GDP than industry and commerce combined. Approximately 85 percent of the foreign exchange earnings are derived from agricultural exports. The current period of prosperity and rapid economic growth is related directly to the rapid expansion of agricultural exports, particularly cotton, during the past 5 years.
- (2) Many factors suggest that it will be exceedingly difficult to maintain the present rate of economic growth because of the rather unfavorable outlook for the three major export crops. The immediate prospects for cotton are not good because of the early season drought and an expected drop in production--plus the possibility of depressed prices resulting from surplus supplies in world markets. Many feel that most of the better cotton land is already in use, necessitating further expansion on land which is less productive or otherwise less desirable.

World markets for both coffee and sugar are glutted and prices depressed. The opportunities for expansion of these two crops in the immediate future are exceedingly limited. Furthermore, there has been very little improvement made in the production of coffee in recent years. Yields and quality are generally below levels needed for the coffee industry to be strongly competitive in world markets.

- (3) There is, and should be, concern over the production of the three basic food crops, corn, beans, and rice. In recent years there has been little or no improvement in yields and total production of these crops, making it necessary for the government to import these commodities.
- (4) The Nicaraguan livestock industry, like most other segments of the agricultural economy, is developing on a rather tenuous base. Despite substantial growth of the industry and expansion of exports in the early 1960's, a drought in 1963 contributed to heavy slaughtering and a sharp reduction in exports along with scarcities in beef for domestic consumption.
- (5) Despite the difficulties confronting Nicaraguan agriculture, it is obvious that the country has great potentials for further agricultural development. It has ample manpower resources; it has relatively large land areas, essentially undeveloped, which could be

used for crops or livestock. Similarly, there are large expanses of forest land which with good management could be made quite productive. The country has favorable soil and climatic conditions for the development of a wide range of agricultural enterprises.

There are opportunities to greatly expand the production of corn, beans and rice--not only to meet domestic needs but for export as well to other Central American countries. Since regional price floors will be established, countries with a deficit production will be forced to import from other Central American countries at prices which will be higher than the world market price.

There are also excellent opportunities to expand beef production for both domestic consumption and for export. The efforts by INFONAC with bananas and Havana tobacco are indicative of the opportunities to develop new sources of agricultural income through the introduction and development of new farming enterprises.

- (6) Normally, the Ministry of Agriculture could be expected to provide the leadership for programs aimed at developing the country's agriculture. Unfortunately, the Nicaraguan Ministry of Agriculture has not provided the leadership and service which was needed in many areas. As a consequence, a number of other organizations have been created to serve needs which the Ministry failed to meet. In some instances, these organizations are doing a splendid job. However, the manner in which they have involved results in the opportunity for considerable overlapping of responsibilities. In our judgment, the Nicaraguan government cannot afford the luxury of this type of multiplicity and duplication of efforts.

A good example of this problem is the recent proposal by the Central Bank to establish a network of agricultural experiment stations throughout the country. There is little question about the need for the sort of research envisioned by this proposal. However, if such research is to be carried out, it should be done by and through the organization charged with the agricultural research responsibility for the country (the agricultural experiment station of the Ministry of Agriculture) so that a total, well coordinated national program might be carried out.

- (7) There is obvious need for better coordination of agricultural programs. Organizations such as INFONAC and the National Bank seem to be operating very soundly and are making significant contributions to the development of the country's agriculture. There is a tendency, however, for each of these organizations to go its own path in program development. For example, INFONAC has a livestock program. The Military Civic Action Program supported by the Central Bank, has come forward recently with its livestock program. The Ministry of Agriculture has its livestock program. There is an obvious need for a single, well

coordinated livestock program for the country, with each organization making its own unique contributions to the total--rather than to have several independent efforts as is now the case. The same would be true with efforts aimed at developing other agricultural enterprises.

- (8) One of the most serious problems limiting the further development of Nicaraguan agriculture is the tremendous lack of trained manpower. The National School of Agriculture has had a program leading to an Ingeniero-Agronomo degree for only a short time. There are very limited opportunities for training in agriculture below the B.S. level. There are extremely few people in the entire country trained in agriculture beyond the B.S. level. The demand is unusually great for personnel with agricultural training at all levels.

One of the reasons for the relative ineffectiveness of the Ministry of Agriculture is the inability to attract and retain qualified manpower. Although salaries within the Ministry would appear to be competitive with most other Central American countries, the demand and competition are so keen that better personnel are attracted by the private sector or to the autonomous agencies which can and do pay more than is possible within the Ministry.

- (9) The Ministry of Agriculture is faced with numerous problems, serious in nature. Morale of employees is low. Salaries are generally not competitive with other sources of employment. Supporting funds are sorely limited. There is considerable evidence of political interference in the employment of personnel and the conduct of programs. As a result, the programs of the Ministry are not making the contributions which are vitally needed.

For example, very basic to further agricultural development is a strong and comprehensive research program. Yet the research program of the Agricultural Experiment Station (SEA) is very limited. Much of the work of the experiment station involves something other than research--in the main services of various types--e.g., soil, seed, and milk testing, insecticide and water analysis, seed and plant production (for sale), planning and laying out irrigation systems, building bridges, etc. Furthermore, the work of the experiment station is centered at one location, La Calera. This one location would be grossly inadequate to sample the wide range of soil and climatic conditions for the country, even if a satisfactory research program were underway at La Calera.

Similar comments could be made about the inadequacy of most of the other programs within the Ministry.

It is obvious that if Nicaraguan agriculture is to continue to grow and realize its full potentials, there must be a major restructuring and revitalizing of the Ministry of Agriculture, particularly the research, extension and educational functions which are so basic to agricultural development.

RECOMMENDATIONS

In the light of the observations and conclusions discussed above, we make the following recommendations for further strengthening the organizations and programs concerned with developing Nicaraguan agriculture:

Manpower and Training

Major efforts should be directed towards enlarging the reservoir of trained manpower in agriculture. The capacity of the National School of Agriculture should be expanded. The participant training program sponsored by AID should, if possible, be enlarged. There should be greater participation by Nicaraguan students in the program of the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica. Action should be taken immediately to develop or expand vocational agriculture programs in some of the "normal" or secondary schools. Special short courses are needed to serve inservice training needs of technicians already employed in agricultural programs. More detailed suggestions concerning training are covered in Appendix "A".

Reorganization of Ministry of Agriculture

We recommend a major reorganization of the Ministry of Agriculture, the details of which are covered in Appendix B. Included are recommendations for additional financial resources necessary to enable the Ministry to effectively carry out its delegated responsibilities and provide the services essential to a sound program of agricultural development.

Coordination of Agricultural Programs

We recommend the creation of a National Agricultural Commission, the organization and function of which are detailed in Appendix C. This Commission with representation from both the public and private sectors would provide the basis for well coordinated agricultural planning and program implementation which is sorely lacking at the present time.

Areas of Program Emphasis

1. We recommend that well-planned programs or "campaigns" be launched to expand the production of corn, rice and beans. There is adequate technology already available to greatly increase the production of all these crops. The major element lacking is a well-coordinated production program vigorously supported by all interested groups.
2. A campaign similar to that for the basic food crops, should also be launched to promote the further development of the beef cattle industry. Although there has been essentially no research in beef

cattle production within Nicaragua, there is sufficient "transplanted" technology readily available to facilitate very significant advances in the beef cattle industry. As in the case of corn and other food crops, there is an opportunity to make substantial advances through the more complete application of what is already known.

3. The coffee and cotton programs require a different type of emphasis than that given livestock and the basic food crops.

The status of world markets and the ability of the Nicaraguan producer to remain competitive will in large measure determine the future for cotton. In view of the relatively high level of technology already in use by the Nicaraguan cotton producer, it is obvious that a more sophisticated research and educational program is needed with cotton. Varieties and practices which have, in the main, been transplanted from the United States need to be carefully evaluated and refined to determine what is best for local conditions. Management practices and production costs need to be carefully analyzed to improve efficiency of operation.

For example, Nicaraguan cotton producers are using very high rates of fertilizers and insecticides. Fertilization according to soil tests and insecticide applications made on the basis of simple surveys of insect infestation, would likely result in considerable savings to many producers.

Overall, major emphasis should be placed on improving production efficiency and lowering unit costs. This may well be essential if Nicaraguan cotton is to remain competitive in world markets.

Since the country is already producing a surplus of coffee, the coffee program should place emphasis upon improving quality and production efficiency. Marginal areas should be switched to other enterprises where possible. Improved technology should be developed and applied to those areas remaining in production in order to raise yields and make Nicaraguan coffee more competitive in world markets--both from the standpoint of quality and cost of production.

4. We recommend a more intensive exploration of the potential for developing or expanding other export crops and livestock products. Particular attention should be given to opportunities to expand export trade within the Central American Common Market. Special marketing studies are needed to explore fully these possibilities.

Nicaragua is far too dependent upon one or two major export crops for a health and stable economic future. Few areas of the world have conditions any better suited to a wide range of crops and livestock enterprises. The need to explore fully the potential for such enterprises emphasizes the essentiality of developing an adequate research program as proposed herein.

APPENDIX A

Manpower and Training

This report has constantly emphasized the fact that the shortage of trained manpower is one of the most important limiting factors in the further growth of Nicaraguan agriculture. The rapid growth of the agricultural sector in recent years has drained the available manpower and has put a serious strain on the already inadequate educational facilities of the country. Several recommendations are outlined below to increase the number of trained technicians in agriculture. Some steps should be taken immediately to improve training of those already working in agriculture. In addition, long-range steps are necessary to ensure that resources are developed to satisfy the needs for trained men which will be demanded for continued expansion and growth of the agricultural industry.

Short Courses. A series of short courses should be initiated by the Ministry of Agriculture now, even while steps are being taken to implement the formation of ITAN. These short courses should be oriented along commodity lines and would serve the dual function of providing intensive training for those actively involved in agriculture, as well as an opportunity to survey the present state of development of knowledge of the various commodities in Nicaragua. This survey would be an important first step in the development of the commodity programs in ITAN. Available material could be brought together from the Ministry, the commercial sector, and possibly from visiting consultants. This material would then serve as a review of all that is known of a particular commodity, as well as to identify those areas which should receive priority in the development of the ITAN program.

The Ministry should provide leadership in developing the courses. However, other agencies in government, and private companies could supply some of the manpower and lecture materials. Courses should possibly last from two days to a week and be open to anyone with background in agriculture. The AID-USDA/PASA arrangement might be used to bring in outstanding lecturers in various fields from foreign countries. These visiting lecturers should be prepared to discuss a given subject in relation to the environment of Nicaragua. For instance, the discussion of the dairy industry in Wisconsin may not have as much application to Nicaraguan conditions as a discussion of dairy problems in Puerto Rico or Jamaica where recent advances have been made in the production of dairy products in tropical environments. A cooperative arrangement between ITAN and a land-grant college, as suggested in this report, would also be another source of lecturers.

These courses should be planned to cover the more pressing areas where additional agricultural training would help Nicaraguan agriculture. All courses should be so designed that a publication or a series of training materials would result. These could then be incorporated into the training, research and extension programs of ITAN. These courses should be a continuing effort and be coordinated with the campaigns to increase crop

production which are discussed elsewhere in this report. The courses also should be coordinated with the activities of the agricultural school.

Vocational Training in Secondary Schools. Reference was made earlier to the large number of Perito Agronomos that will be needed in Nicaragua by the year 1975 (an estimated 1,600).

The only school that is actively producing any trained personnel at the secondary level now in the country is the International Agricultural School at Rivas. The Ministry of Education has taken the initiative in developing additional schools of agriculture and hopes to begin three next year. However, these four schools will not be adequate to supply the required manpower.

We recommend that the Ministry of Agriculture, in collaboration with the Ministry of Education, undertake a survey of future manpower needs of the agricultural sector. This survey should not only study the number of graduates that will be needed, but should also try to identify the types of training that will be most useful to meet the needs of Nicaragua. On the basis of the survey, the Ministry of Education should then try to increase the number of vocational schools to meet the needs of the country.

Programs at this level should place strong emphasis on practical training of a vocational nature. Undoubtedly, it will be difficult to equip schools sponsored by the Ministry of Education so that the students would have access to adequate demonstration materials. Therefore, a strong effort should be made to collaborate with the agricultural industry and the Ministry of Agriculture in order that the students may make frequent visits to places where agricultural operations are actually in progress, and perhaps even have an opportunity to obtain some practical experience.

The Ministry of Education has expressed a strong interest in promoting cooperation with the Ministry of Agriculture in the development of the vocational agricultural schools. This type of cooperation is to be strongly encouraged. The Ministry through ITAN could provide advice on the organization of training materials, and help substantially by providing some of the actual course materials in written form as an outgrowth of short courses and extension publications.

Escuela Agricola Panamericana. Eighty-four Nicaraguans have received practical agricultural training in Honduras at this school. Continual encouragement should be given to eligible students in the future, since graduates have occupied important roles in the public and private sectors of Nicaraguan agriculture. The school may eventually be training students at the equivalent of the Ingeniero Agrónomo, at which time it may complement the training of the National School of Agriculture.

Inter-American Institute of Agricultural Sciences. This School is the only graduate training Institute in Central America. Though it is in

Costa Rica, next door to Nicaragua, no Nicaraguan has taken an advanced degree there. At present, one Nicaraguan student is now taking graduate work in Forestry. As ENAG turns out an increasing number of college trained students in agriculture, it is strongly recommended that some of these students take advanced training in Turrialba.

The Institute is not only involved in training but is also engaged in fundamental research. A closer contact with the School, which would result from students making more frequent use of the resources, could result in much of the research being transplanted to Nicaraguan conditions. The library of Turrialba is also a useful adjunct to the training and research programs in Nicaragua, since Nicaraguan facilities are woefully inadequate.

National School of Agriculture. Recommendations for the School are largely covered in the recommended reorganization of the Ministry of Agriculture. The program of the School should be modified to allow the graduation of approximately 40 students per year. This can be done by enlarging the present facilities to accommodate an estimated student body of 250-300. Or, students could take their first two years of college training at the National University which would allow the proposed number of students to graduate with the present size of physical plant. This latter step would result in a more efficient use of the facilities and a more thorough grounding in the basic sciences. A degree should be offered for students who do not complete their thesis if ENAG is unable to provide adequate supervision for thesis projects.

Strong encouragement should be given to boys of rural areas to attend the School; so far most students come from the larger cities. Perhaps a general campaign conducted by the Ministry of Education in regional secondary schools might help to accomplish this objective.

AID Participant Training Program. The provision of scholarships by AID to Nicaraguan nationals is to be strongly encouraged. Although this program has been a major effort of AID/Nicaragua in the past year, we feel there is ample justification to expand it. This, in our judgment, is one of the best uses of technical assistance funds, particularly when one of the most important needs in Nicaragua now for continued economic development is a large increase in the amount of trained manpower.

Elsewhere, in this report we have suggested that ITAN seek an alliance with a land-grant college to implement the early phases of the reorganization program. If this suggestion is accepted, we would urge that, where possible, college trainees be sent to the cooperating land-grant institution. This would result in a better integrated training program which would be more closely identified with the problems and needs of Nicaragua. Occasionally it would be necessary for students to go to other institutions to take advantage of highly specialized programs.

Students who are trained abroad under the sponsorship of the Ministry of Agriculture, should be obligated to work a certain period of time for the Ministry after they return--perhaps a year and a half for each year of study.

APPENDIX B

Reorganization of the Ministry of Agriculture

There are a number of organizations in Nicaragua concerned with agricultural development. In other countries, the counterparts to many of these organizations are found within the Ministry of Agriculture.

We do not feel that it is now feasible to attempt a major reorganization of the various agricultural agencies to bring most, if not all, within a single administrative framework (such as MAG). It is most essential, however, that the program of these various organizations be well coordinated. We will recommend in Appendix C a means of achieving desired coordination among the existing organizations.

Furthermore, we will recommend a specific restructuring of the programs within the Ministry of Agriculture to enable it to carry out its responsibilities more effectively. Major attention will be focused upon the agricultural research, teaching and extension functions of the Ministry.

Research, Teaching, and Extension

A recent report of the Food and Agricultural Organizations of the United Nations emphasizes the tremendous importance of the agricultural research, extension, and educational functions within a country:

"Agricultural education, research, and extension are three of the essential services that a government must provide for a country's agricultural development. Research evolves new ideas and new techniques, extension helps farm people to put into practice the products of research, and education provides trained personnel for all agricultural development, including research and extension. The three services constitute the framework in which government effort--can benefit the farming population. Whether such effort is utilized in the most effective and economic way depends on the organization and administration of these services which are closely interrelated."

The FAO report emphasizes the necessity for the research, teaching and extension functions to be closely integrated:

"One good example of the coordination among education, research, and extension is found in the land-grant colleges in the United States, where the three functions are under one administration. A publication from Cornell University says: Complete specialization in research or in teaching seldom gives best results. The mutual stimulation of research, teaching, and extension is essential to the best progress of colleges of agriculture. Teachers need contact with research in order to keep abreast of their profession; research workers need the stimulation of students and of farm prob-

lems which they can help solve; and extension workers have nothing to extend unless they have research results. This close association explains the efficiency of extension, the effectiveness of training, and the usefulness of research in the United States."

Instituto de Tecnologia Agropecuaria de Nicaragua

As the first step toward providing a strong, well coordinated program of agricultural research, education, and extension, we recommend that the National School of Agriculture, the Agricultural Experiment Station, and the Agricultural Extension Service be organized into a single autonomous administrative unit, either within or outside the Ministry of Agriculture. We concur with earlier recommendations that such a unit might be called Instituto de Tecnologia Agropecuaria de Nicaragua (ITAN).

We feel that the creation of ITAN would serve a number of important objectives. It should:

1. Provide effective programs of research, education and Extension which are vital to the further development and improvement of Nicaraguan agriculture.
2. Ensure the continuity of programs and permanency of qualified personnel.
3. Provide needed protection from political interference in appointment of personnel and conduct of programs.
4. Make maximum use of available human, physical and financial resources.
5. Provide effective coordination of the research, education and extension functions which are highly complementary in nature.
6. Place specific responsibility for the nation's agricultural research, education, and extension work and avoid duplication of activities among other groups and agencies.

We see little advantage in having this autonomous body as a part of MAG. On the other hand we see no strong objection to having ITAN attached to MAG provided necessary operational freedom can be assured. For purposes of this report we will proceed with the assumption that ITAN would be attached to MAG.

We recommend that appropriate legislation be drafted and presented for the following:

1. Autonomous status within MAG wherein appropriations are earmarked specifically for the Institute.
2. Freedom from political interference or control--autonomy in the conduct of programs, appointment of personnel, etc.

3. Designation of a Director General as the chief administrative officer, responsible for overall leadership and program coordination.
4. Appointment of a Board of Trustees with responsibility for periodic review of programs and for the establishment of broad policies to govern the operation of ITAN.
5. A delineation of responsibilities--namely to charge the Institute with responsibility for the research, extension and college-level training in agriculture within Nicaragua.

Board of Trustees

We suggest that the Board of Trustees include the following: Minister of Agriculture, Minister of Education, President of INFONAC, President of the Agrarian Reform Institute, Rector of the National University of Nicaragua, President of the National Bank, and President of the Central Bank--all as ex-officio members. In addition, the Board would include six agricultural leaders from the private sectors. There should be an attempt to have the six "at large" members representative of the major agricultural enterprises--cotton, beef, coffee, food grains, etc., plus agricultural business interests such as fertilizers, insecticides, feed, machinery, etc. Regional representation should also be achieved, on the Board insofar as possible.

The Board would periodically review the programs of the Institute, develop and implement broad policy guidelines, approve budget requests and operating budgets, and approve appointments of major administrative personnel.

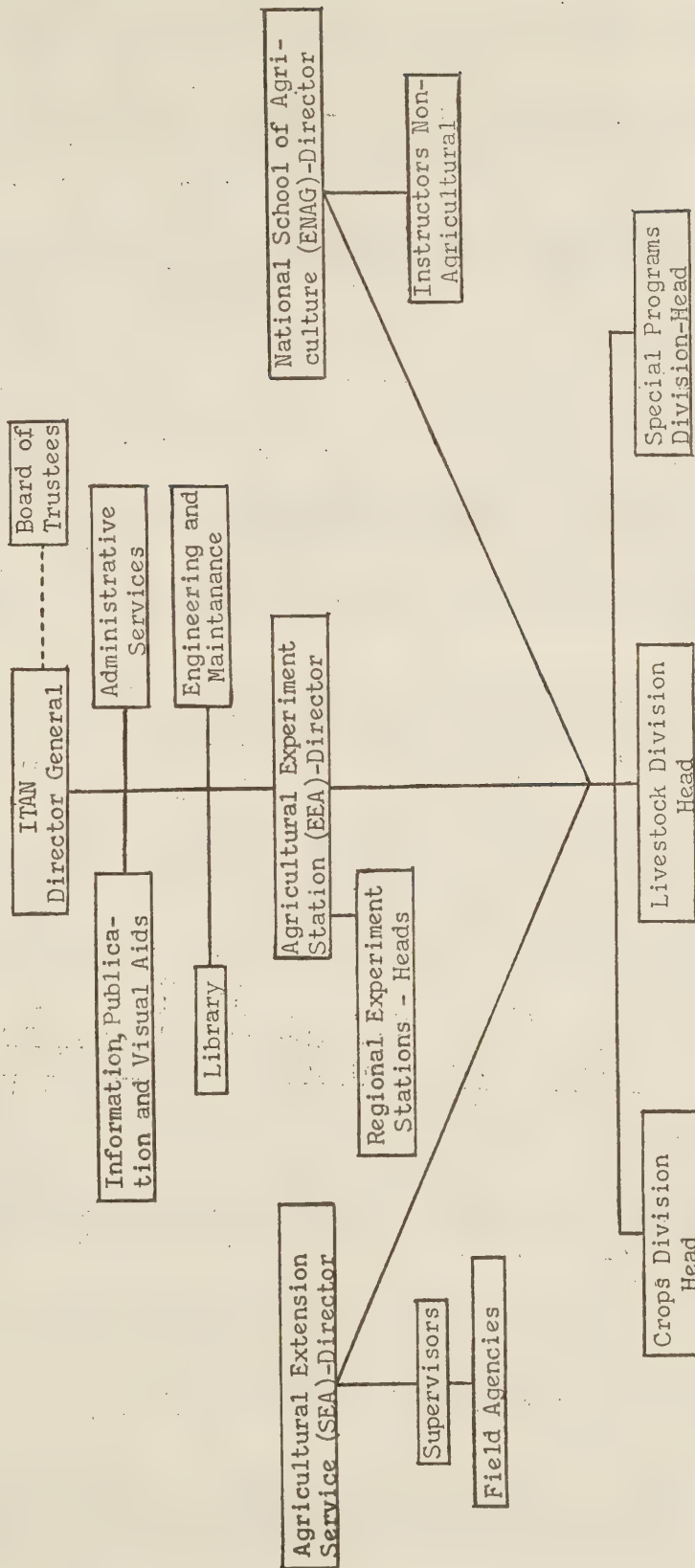
Organization and Administration of ITAN

Figure 2 provides a schematic outline of the proposed organization of ITAN.

The Director General would be the chief administrative officer. He would be appointed by the President of Nicaragua from a list of three candidates submitted to him by the Board of Trustees.

Working closely with the Director Council as a part of an administrative team would be the Directors of the three major program units--ENAG, EEA, and SEA. The three Directors would be appointed upon the recommendation of the Director General and approval of the Board of Trustees. These four individuals would comprise the Executive Committee of the Institute and would be responsible for developing and executing a well-coordinated research, teaching and extension program to serve the needs of Nicaraguan Agriculture. Final authority for appointment of technical personnel would be vested in the Executive Committee of the Institute.

Proposed Organization of Instituto de Tecnologia Agropecuaria de Nicaragua



- Division of Crops Programs: Corn and sorghum, rice, beans, cotton, coffee, sugar cane, vegetable crops, fruit crops, ornamentals, fiber crops, forestry, tobacco, bananas, miscellaneous crops.
- Division of Livestock Programs: Beef, swine, poultry, dairying, apiculture, forage crops, veterinary science.
- Division of Special Programs: Marketing, farm management, statistics, community development, home economics, youth programs, entomology, soils, plant pathology.

The Director General would have four sections attached directly to his office which would serve the total Institute. These would include:

1. Administrative Services -- with responsibility for budget and finances, accounting, personnel, equipment inventory, office supplies, and other administrative services.
2. Engineering, Maintenance and Motor Pool -- with responsibility for upkeep of buildings and grounds, planning and construction of minor farm buildings, renovation of buildings, construction of cabinets, laboratory benches, etc., maintenance of machinery and equipment, operation of motor pool, and related activities.
3. Library -- to serve the needs of all units within ITAN - including both students and staff.
4. Information, Publications and Visual Aids -- with responsibility for news releases, publication of bulletins, circulars, preparation of tapes for commercial radio station use, editing of manuscripts written by staff members, art work for illustrations, visual aids for both teaching and extension programs, and related activities.

Most of the technical staff of ITAN would be located in three program divisions. Under each division there would be a number of research and educational program groups--(not administrative units).

The three division heads would exercise leadership in course and curriculum development, and, for this would be responsible to the Director of ENAG. Similarly, they would assume leadership in the organization and conduct of research programs and, for this would be responsible to the Director of EEA. In a like manner, they would be responsible to the Extension Director for program leadership in the area of Extension work.

The technical personnel within these three divisions would be full-time employees of ITAN, but their time might be divided among two or more of the major areas of work (research, teaching and extension). We would expect, for example that most of the teaching staff of ENAG would also be engaged in research--or possibly extension. Teaching responsibilities should be a part of a total work load and should not be in addition to a full-time appointment in another area of the Institute.

The program of the three divisions will be primarily product- or problem-oriented. Within such an organization, there would be a person in charge of each of the major areas of work who would have responsibility for leadership and coordination of a total research and educational program for that commodity or program area. However, this would be program leadership, not administration.

For example, the leader of the corn program would have responsibility for a total research program with corn, including varietal evaluation, insects, diseases, fertilization, and other cultural practices. The

primary work of the technicians in the non-commodity program areas such as soils, plant pathology, entomology and agricultural engineering would involve cooperative efforts in support of the various commodity programs.

In addition to his leadership in research, the program leader for corn would also be responsible for planning and implementing extension programs designed to encourage the use of the very best technology in corn production by the farmer. The leader would therefore work with extension agents in training them, putting out demonstrations, holding field days, etc.

Not only would such a person exercise leadership for a total program within ITAN, but he could provide much needed leadership and program direction with other groups as well. There is a distinct void of such leadership at the present time, and as a result, technicians in the National Bank, INFONAC, IAN, and other groups, both public and private, have nowhere to turn for assistance in carrying out programs with the various agricultural commodities or enterprises.

We would emphasize that such a program leadership role demands well-trained, highly qualified personnel who can command the respect of their colleagues and, in fact, earn such a leadership role.

Much of the Extension subject matter leadership normally supplied by full-time extension specialists would be provided through the commodity program leaders--at least in the beginning. There are several reasons for these recommendations:

First, there is an acute shortage of well-trained manpower to provide leadership for both extension and research within a given program area.

Secondly, much of the effort of the experiment station now is more representative of extension work than research. This includes for example, advice in laying out irrigation systems, developing farm conservation plans, diagnostic services with plant and animal diseases, etc.

Finally, much of the work of the Experiment Station will continue to be adaptive research which can and should be tied closely to extension programs. Consequently under these circumstances it is logical to have the extension and research functions within the major subject matter areas under a single leader.

Personnel Requirements

The real key to the successful implementation of ITAN will be the development of a highly qualified staff in the three program divisions (crops, livestock and special programs). Extreme care should be taken in filling key leadership positions, drawing upon the best of the current staff, those now taking advanced training, or others now employed elsewhere. Positions should be left temporarily vacant, if necessary, or filled with temporary personnel if the right person is not immediately available.

We recommend that the following programs be established with the indicated number of qualified technical personnel in each:

Crops Division

Corn and grain sorghum	4	Forestry	2
Rice	2	Sugar cane	1
Beans	2	Ornamentals	1
Cotton	3	Tobacco	1
Coffee	3	Bananas	1
Vegetable crops	2	Fiber crops	1
Fruit crops	2	Miscellaneous crops	2
Total			27

Livestock Division

Beef	3	Veterinary science	2
Swine	2	Forage crops	3
Dairying	2	Apiculture	1
Poultry	2	Total	15

Division of Special Programs

Marketing	2	Home economics	2
Farm Management	1	Entomology	3
Experimental statistics	1	Plant pathology	3
Community development	1	Soils	3
Youth programs	1	Ag. engineering	2
Total			19

There would be a program leader in each of the areas specified above. As discussed earlier he would have responsibility for leadership of a total research and extension program for his particular area. In a few instances, such as the youth program this individual would be concerned primarily with extension work. Many programs will have one or more assistants. The agricultural teaching staff would be drawn from the staff of the three divisions. In addition, the equivalent of four full-time positions are recommended to handle the non-agricultural teaching-- language, math and the basic sciences.

Of the 65 positions, an equivalent of 12 would be devoted to teaching, some 15 to extension, and the remaining 38 to research.

We would not expect that intensive research programs would be carried on immediately with several crops such as sugar cane, tobacco and bananas. Obviously, this would not be possible with just one man in each area-- particularly when that man must also be responsible for extension pro-

grams and any teaching that may be done in subject matter relating to this crop. However, there is need for someone within the total research and extension program to stay abreast of new developments in the culture of these crops and be in a position to render technical assistance as needed. For example, once INFONAC has a successful banana or tobacco operation underway, their mission is essentially completed. However, it is necessary to provide continuing technical assistance to the producers of these crops. This should be the responsibility of ITAN.

We also recommend that ITAN assume responsibility for the research and educational work related to coffee production. This would leave the Coffee Institute free to concentrate its efforts on the very serious marketing problems facing the coffee industry. For many reasons, we feel that the research and extension work relating to coffee production can be carried out more effectively and efficiently as a part of a total agricultural development effort within ITAN.

Most of the programs are self-explanatory. However, the exact functions of several should be clarified. Several of the special programs are designed to support the commodity programs. For instance, the primary function of the soils program is to assist commodity programs with work on fertilizer trials, soil analyses, the selection of representative experimental sites, and soil management practices (including drainage, irrigation, green manuring, and conservation practices). Perhaps a small amount of soil surveying will be done, but it is anticipated that most of this will be carried out in collaboration with the new natural resources program which will be coordinated by the National Planning Office.

ITAN must, of necessity, work on forestry programs as a contribution to a well-integrated effort designed to determine the best utilization of all areas of the country, including marginal areas best adapted to forestry. A forestry program should also continue to be operated in the Division of Natural Resources in MAG. However, this program will be more concerned with regulatory activities and service programs, such as the production and dissemination of nursery stock, protection of forest lands, etc. These two programs (ITAN and Natural Resources) should be regarded as complementary and close cooperation would be expected.

It will be noted that the proposed reorganization not only implies but demands cooperation between the various programs. Some flexibility has been provided in the structure to make the maximum use of a limited number of technicians. ITAN can not afford the luxury of duplication of efforts or lack of cooperation among the various programs--particularly between the commodity-oriented programs and the basic disciplines which should provide support. The ability and willingness to cooperate with other programs should be considered a requirement of all technicians. ITAN will not have unlimited resources, and an uncooperative attitude of its employees should be unacceptable to the administration.

Relocation of Experiment Station and School of Agriculture

For several months serious consideration has been given to the need of relocating the teaching and research programs at La Calera. The enlarge-

ment of the adjacent airport will result in the loss of considerable experiment station property and further aggravate an already serious lack of land for research purposes. Recommendations have been made by a special study committee to relocate these programs. We fully concur in these recommendations.

Such a move could be a great blessing. It could provide for a much better site for the central experiment station of the country--a site much more representative than the present location. It could also provide adequate land on which to develop a research program. In addition, it could provide an opportunity to enlarge the facilities of the School of Agriculture to accommodate needed growth in enrollment. And finally, it could provide the facilities needed for the proposed creation of ITAN and the integration of the teaching, research and extension functions of MAG.

AID has indicated it would consider a request for a loan to accommodate the relocation of the program at La Calera.

The new site for ITAN should have at least 500 manzanas of land, half or more of which should be relatively uniform and readily usable for experimental purposes. The land should be representative of as wide an area as possible from the standpoint of crops, soil, climate, and general ecological conditions. Consideration should also be given to the desirability of having it located reasonably near Managua or another major city for convenience to staff and students. Obviously the facilities at La Calera should not be relinquished until the new site is ready for use.

Programs of the Agricultural Experiment Station (EEA)

The program of the Agricultural Experiment Station should be focused primarily upon the problems limiting the further development of Nicaraguan agriculture. They should be highly applied in nature. They should be primarily concerned with the adaptation of transplanted technology--technology which has proved to be good elsewhere. The more sophisticated basic research which a Nicaraguan graduate student may do for his thesis in a foreign country has little or no place in the research program within Nicaragua at this stage of development.

Efforts should first be focused upon an evaluation of genetic material (plant and animal) developed elsewhere, to determine which is better adapted to Nicaraguan conditions. Simple N-P-K fertility tests are needed under various soil conditions throughout the country to determine fertilizer needs. In a similar manner, insect, disease, and weed control practices need to be evaluated. Other basic cultural practices also need to be studied under local conditions. There are excellent opportunities to make some substantial improvements in Nicaraguan agriculture through such efforts.

There is an obvious need for this type of research to be carried on throughout the country in order to appropriately "sample" the wide

range of climatic and ecological conditions. A recognition of this need has motivated the leaders of the Central Bank to propose the establishment of several experiment stations throughout the country. Dr. Vincent Plath of the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica, has suggested that there are some 6 major agricultural regions of the country wherein conditions are sufficiently different to warrant separate research centers in each.

We do not question the desirability of such facilities. However, we would strongly recommend against their establishment outside of the framework of the Agricultural Experiment Station as some have suggested. To the contrary, these regional experiment stations should become a part of a revitalized program of research envisioned under ITAN so that the work conducted at these locations could be made an integral part of a well-planned total program of agricultural research for the country.

It is extremely doubtful if there is adequate manpower available to start all of these regional experiment stations at one time, even if financial resources were at hand. We would recommend, therefore, that first priority be given to the relocation of the central experiment station as discussed above. Then the regional stations could be activated in a well-planned, systematic fashion--perhaps at the rate of about one new one per year until the system has been completed.

We do not recommend that these regional research centers have elaborate facilities and a large resident staff. Except for those in more remote areas, much of the work at the regional centers might be carried out under the direction of the program leaders from the central station.

The facilities at El Recreo are obviously very adequate to serve the needs for a regional research center for that section of the Atlantic Plain. Responsibility for these facilities should be turned back to the experiment station from the extension service.

In the meantime, until suitable research centers are available, we would strongly recommend that field tests be carried out in the major agricultural areas of the country by the commodity program leaders within ITAN and with assistance from extension agents. Relatively simple fertilizer and variety tests carried out on private farms could supply much needed research information and at the same time serve as field demonstrations for the extension program. With some training and supervision, extension agents could very readily provide the assistance needed to carry out these programs. The obvious opportunities and need for this type of cooperation between research and extension provide further support for charging the commodity program leaders in ITAN with dual program leadership responsibilities as we have proposed.

We recommend that a number of programs now carried out by the Agricultural Experiment Station be terminated or transferred to another part of the Ministry. The practice of the Agricultural Engineering Department to provide free labor to private farms for such things as constructing terraces or drainage systems should be stopped. The planning of irrigation or conservation systems on private farms, if done at all, should

be done through the Extension Service. The production of fruit trees, ornamental plants, and certified seed for sale should be done by private nurseries and seed producers, rather than the Experiment Station. The milk, seed, fertilizer, feed, and insecticide testing programs logically belong elsewhere within the Ministry, closely identified with those divisions responsible for enforcing the regulations with respect to these items. The soil testing laboratory should be made a part of the soils program within ITAN.

The laboratory facilities of ITAN would complement those of the service divisions of MAG. For instance, ITAN could be quite helpful in establishing methods of analysis to be used for regulatory activities under local conditions. They could also help in the testing of new analytical methods to meet the growing needs of industry.

Programs of the Agricultural Extension Service

The fact that much technology is already available to greatly improve the efficiency and productivity of the Nicaraguan farmers provides a great opportunity to the Extension Service. Extension should provide the leadership for well planned campaigns and continuing programs to have this technology applied and take advantage of such an opportunity.

The first requirement for such efforts is strong leadership by specialists or program leaders who can plan, organize and carry out intensive education programs to achieve desired goals. The second requirement is an effective field staff to carry these programs to the individual farmer and to encourage his adoption of them.

Currently, the extension service has neither the specialist program leaders nor an adequate field staff to do this job. We recommend that first priority be given to developing an adequate complement of program leaders as we are proposing under the ITAN organization. With such leadership, much can also be accomplished by working with and through the technical staff of other organizations such as the National Bank, INFONAC, IAN and others.

At the same time we recommend steps be taken to enlarge the size of the field staff in Extension. We suggest that some five new agencies per year be added in each of the next five years giving a total of 42 by 1971. A careful study is needed to determine priority of establishment and areas to be served by the new extension agencies.

Each agency should have a minimum of one agent and two assistants (one in agriculture and one in home economics). Programs in all agencies should include youth (4-5) as well as adult work.

With the proposed enlarged and revitalized extension program, the Agriculture Extension Service could provide the needed education and technical backstopping for rural credit programs of the National Bank, Agrarian Reform Institute, INFONAC and other organizations greatly in need of such help.

Programs of the School of Agriculture

We should first recognize the apparent interest of the National University of Nicaragua in the development of an agricultural program. With proper restructuring of the program of the National School of Agriculture as a part of ITAN, we do not think it is desirable to establish, in effect, a parallel program within the University. On the other hand we feel that there would be much merit in a program of close collaboration.

We suggest that serious consideration be given to making the School of Agriculture (ENAG) an "upper division" program open to students who take their first two years at the University. During these first two years, the student would take all of his basic courses in mathematics, the physical, biological and social sciences, languages, etc.--reserving the last three years for his technical agricultural training at ENAG. With a carefully planned and well integrated program, the faculty of the School of Agriculture might be given "courtesy" appointments within the University and the degree in agriculture might be endorsed by the University.

We have not fully explored the feasibility of such an approach but we believe that it merits serious consideration. With the present very high rate of attrition of students within the School of Agriculture, this approach could provide a very effective screening process which would result in more effective utilization of the facilities of ENAG and a greater turnout of graduates.

If the first two years of the five-year program in agriculture could be taken at the University, ENAG could accommodate with present facilities some 150 students (an average of 50 per class in the third, fourth and fifth year). With normal attrition in the third, fourth and fifth years, an estimated 35-40 students would graduate annually. This might be considered a minimum rate of production of new agriculture graduates needed to meet the demands of the country.

If the full five years program is given at ENAG, we recommend that in planning for its relocation, the school's capacity be increased to some 250-300 students. This total will still produce only 35 to 40 graduates annually.

Students at ENAG are all currently taking a single curriculum. The need for more specialized training is becoming increasingly obvious. We recommend therefore, that the curriculum be reorganized to permit students to major in either the plant or animal sciences. Such curricula would provide a broad general training in agriculture with a greater degree of specialization in either crops or livestock. Within a few years serious consideration might be given to adding still another curriculum in agricultural economics.

Only a small percentage of the students who complete the course requirements at ENAG actually receive the Ingeniero Agronomo degree. Indeed, most students leave before they complete the thesis requirements for such a degree. This apparently happens for two principal reasons: 1) the great demand for graduates, and 2) the lack of suitable supervision of

thesis programs. Perhaps ENAG should not insist on a thesis as a prerequisite for a degree if it is unable to provide adequate thesis supervision. However, this suggestion should be studied in the context of requirements of other agricultural colleges in Central America, since CSUCA is making a strong attempt to develop uniformity of University educational standards throughout the region.

Implementation of Recommendations

Recognizing that we must start with the programs and personnel as they now exist and that the accumulated deficiencies of a decade can not be corrected overnight, we make a number of suggestions concerning the implementation of our recommendations.

There is a real sense of urgency to move as rapidly as possible to accomplish the objectives set forth in this report. We emphasize the fact that Nicaraguan agriculture is resting on a very weak institutional foundation. Further delays in developing effective research and education programs in agriculture could be very damaging to the nation's economic future.

If there could be general agreement within GON to proceed with the establishment of ITAN, we suggest that the actual reorganization begin immediately, even before the proposed legislation is passed creating the Institute. Presumably this could be done as an internal reorganization of MAG. However, if this were done, we feel that legislative action to create ITAN as an autonomous unit will still be essential to ensure the permanency of such an organization.

The first step should be the appointment of a Director General who could begin immediately to implement the proposed reorganization. This appointment must be accompanied with full authority to proceed in making needed adjustments.

The Director General should be an outstanding professional agriculturist, skilled in administration, with at least an MS degree, and with experience in research, teaching, or extension. He should be a person highly dedicated to the task of developing the strongest and most effective program possible. The salary for this post must be competitive with those in other agencies in order to attract and retain a man of outstanding ability.

To enable the Director General to begin the needed changes, the total budget for the programs to be included under ITAN should be increased some 20% next year. This would provide an increase of approximately 1.5 million cordobas. A critical need exists for at least this much increase immediately to even start the process of building a truly effective program. (If other justifications were necessary, such an increase could be warranted on the basis of a recommendation that the work week within the Ministry be increased from 34 to 40 hours--an increase of some 18%).

We should emphasize that increased appropriations should not be used for "across the board" salary increases. Very selective merit raises should be made to increase salaries to the point that ITAN could be able to attract and retain the best personnel available. Furthermore, there should be a conscientious effort to weed out the unproductive employees--political appointees or otherwise.

During the next five years it will be necessary to further increase appropriations to make possible the expansion in Extension field agencies (5 per year), the development of regional experiment stations (one per year) and a modest increase in salaries and operating expenses (5% annually).

Following is an estimated schedule of appropriations for the period 1966-71 to implement these recommendations.

Schedule of Appropriations for ITAN, 1966-1971

Present Budget

Division of Economic Studies	C\$ 383,500
Agricultural Experiment Station	3,524,938
Agricultural Extension Service	2,646,826
National School of Agriculture	<u>1,112,570</u>
	C\$ 7,667,834

1966 Appropriation

20% increase in current appropriation	<u>1,534,000</u>
Total, 1966	C\$ 9,202,000

1967 Appropriations

5% increase for operations	450,000
5 New Extension Agencies	600,000
1 New Regional Station	<u>500,000</u>
Total, 1967	C\$ 10,752,000

1968 Appropriations

5% increase for operations	C\$ 538,000
5 New Extension Agencies	600,000
1 New Regional Station	<u>500,000</u>
Total, 1968	C\$ 12,390,000

1969 Appropriations

5% increase for operations	C\$ 619,000
5 New Extension Agencies	600,000
1 New Regional Station	<u>500,000</u>
Total, 1969	C\$ 14,109,000

1970 Appropriations

5% increase for operations	C\$ 705,000
5 New Extension Agencies	600,000
1 New Regional Station	<u>500,000</u>
Total, 1970	C\$ 15,914,000

1971 Appropriations

5% increase for operations	C\$ 796,000
5 New Extension Agencies	600,000
1 New Regional Station	<u>500,000</u>
Total, 1971	C\$ 17,810,000

In our judgment the GON could make no wiser investment in its economic future than to commit itself to the expenditure of these funds. This increased level of expenditures would at the end of five years amount to less than 4% of the present government budget. This is by no means excessive support for a function which is so vital to the economic life of the nation.

Assistance from AID in Implementing Recommendations

We fully concur with the emphasis AID is currently giving participant training programs and recommend that these efforts be continued and, if possible, expanded. The development of truly effective programs of agricultural research, extension, and teaching will depend primarily upon the availability of well-trained manpower. This is a need which must be satisfied if agricultural goals are to be met.

We recommend that, if requested, AID make a loan to the Nicaraguan Government for the relocation of the School of Agriculture and Experiment Station at La Calera, as well as for the establishment of needed facilities to accommodate the requirements of the proposed creation of ITAN. This should include funds for the ITAN headquarters and for the central experiment station, office facilities, laboratories, classrooms, dormitories, farm buildings, fences and other physical improvements. The loan should also provide needed resources to establish dairy and beef herds on the Experiment Station farm as well as funds to purchase needed laboratory and farm equipment. We would estimate some \$3 - 4 million would represent the anticipated cost of the total project before the loan is granted.

We would also recommend that, if requested, loans be made over the next five years to establish a system of regional experiment stations. We would estimate that the cost of each may be \$100,000 to \$200,000 or a total cost of \$400,000 to \$800,000 during the next five years.

In order to accomplish the objectives set forth in our recommendation to create ITAN, we feel that it is most important that a group of qualified specialists or technicians be made available to advise the staff of the new organization in the planning and implementation of new programs. The request to the United Nations Special Fund, if approved, will help meet such a need. We feel, however, if UNSF assistance should become available it would be advisable to develop a relationship with a land-grant university where a single institution, using the best resources at its disposal, could, through a partnership relationship with ITAN, provide the needed assistance.

If the UNSF support is not available and if requested by GON, we would recommend that AID make a "soft" loan to provide the financial support necessary to make possible this assistance. Regardless of source of support, however, we would recommend that the following assistance be provided for the first 2 years of a 5-year period.

- 1 - Administrative advisor and leader of University team--a senior administrator of a land-grant college of agriculture (Dean or Director or Assistant Dean or Director)
- 1 - Specialist in forage crops
- 1 - Specialist in field crops
- 1 - Specialist in marketing
- 1 - Specialist in animal husbandry
- 1 - Extension supervisor
- 4 - Full-time equivalent positions as short-term personnel.

Most of the specialists should be primarily research oriented although they should have some experience in teaching and possibly extension as well. After the first 2 years, only the administrative advisor will remain as a resident in Nicaragua to provide continuity. He will continue to be assisted by short-term personnel.

The short-term personnel would make possible the involvement of key people from the total staff of the research, teaching and extension program of the land-grant institution.

Table 4 provides a detailed budget of the approximate cost of a 5-year cooperative program with a land-grant university involving an average of some 10 technical personnel annually (6 full-time in Nicaragua and 4 full-time equivalent in short-term personnel) for the first 2 years and 5 technical personnel annually thereafter.

In the interim, before such assistance becomes available, perhaps some short-term help could be provided under the AID-USDA/PASA program to enable plans for the implementation of ITAN to proceed immediately.

We would suggest that all technical assistance of AID direct hire personnel, USDA PASA, and a land-grant college if approved, be coordinated by AID/Nicaragua. This would prevent unnecessary duplication of efforts and increase the effectiveness of such assistance.

We would also like to point out the need for providing some training in administration to officials of ITAN and MAG. Several programs have been quite useful in this respect. Among these are the OAS School of Public Administration in Costa Rica, a similar AID supported school in Puerto Rico, and the inservice training provided through AID, USDA, and U.S. universities. This training in administration and management of agricultural institutions should be utilized to improve administrative capability.

Other Programs within MAG

We have not attempted an analysis in depth of the other programs of the Ministry since this was not the objective of our mission. However, our observations lead to a number of suggestions which in our judgment would improve the effectiveness of the organization.

Division of Economic Studies

This division is authorized to carry out a wide range of economic programs including marketing, planning, farm management, etc. However, its activities are primarily limited to the gathering of agricultural statistics. The fact that several other organizations and agencies in Nicaragua are also collecting agricultural statistics, more or less independently of each other, suggests very strongly a need for some coordination in this area. A single agency, perhaps in the Ministry of Economy, may provide effective leadership and coordination for this.

TABLE 4 - ESTIMATED FIVE-YEAR BUDGET FOR LAND-GRANT COLLEGE CONTRACT

	Y E A R S				
	1st	2nd	3rd	4th	5th
<u>PERSONNEL</u>					
Team Leader	\$ 19,800	\$ 20,700	\$ 21,735	\$ 22,822	\$ 23,963
Specialists (5)	77,000	80,850	67,914	71,310	74,875
4 F.T.E. Short-Term	61,600	64,680	7,718	8,104	8,509
Campus Coordinator ($\frac{1}{2}$ time)	7,000	7,350	6,615	6,946	7,293
Secretary	6,000	6,300			
SUBTOTAL	\$ 171,400	\$ 179,880	\$ 103,982	\$ 109,182	\$ 114,640
<u>ALLOWANCES</u>					
Shipment Household Goods	6,000	6,000	1,000	1,000	1,000
Housing Allowance @ 2700	16,200	16,200	2,700	2,700	2,700
Salary Differential @ 20%	19,360	20,310	4,347	4,564	4,793
Educational Allowance @ 500	3,000	3,000	500	500	500
SUBTOTAL	44,560	45,510	8,547	8,764	8,993
<u>TRAVEL</u>					
U.S. Travel (1*) 30 @ \$60R.T.	1,800	1,800	1,800	1,800	1,800
International Travel 30 @ \$160 R.T.	4,800	4,800	4,800	4,800	4,800
In-country Travel	5,000	5,000	5,000	5,000	5,000
Per Diem	33,000	33,000	33,000	33,000	33,000
SUBTOTAL	44,600	44,600	44,600	44,600	44,600
Overhead (2*) @ 20%	52,112	53,998	31,426	32,509	33,647
Equipment and Supplies	10,000	10,000	5,000	5,000	5,000
(Vehicles, Teaching Aids, etc.)					
TOTAL	\$ 322,672	\$ 333,988	\$ 193,555	\$ 200,055	\$ 206,880
GRAND TOTAL FOR FIVE YEAR PERIOD: \$1,257,150					
(1*) US Travel amount depends on location of college.					
(2*) Overhead calculation depends on individual college.					

We recommend that the responsibilities for research and education related to farm management, production costs and marketing, and related economic studies become a part of ITAN within the Division of Special Programs. However, planning, policy and marketing regulatory functions should be a part of MAG. If it is necessary to maintain a statistical section within the Ministry, one can be created for this purpose.

Division of Natural Resources

The role of this division and its relationship with other agencies such as the Ministries of Economy and Hacienda are not too clear. It would appear that more complete responsibility for programs in forestry, fish and wildlife might be shifted from these other agencies to the Division of Natural Resources within MAG.

Division of Agriculture and Livestock

These divisions are concerned with a number of pest control, regulatory, and inspection functions which are common to ministries of agriculture. We have not attempted a careful study of the adequacy of these efforts although it is obvious that these services might be expanded and improved.

We recommend that consideration be given to the passage and enforcement of effective laws to protect the farmer and consumer in a number of areas. For example, there is obvious need for laws governing the sale of fertilizers, pesticides, seed, feed, etc. With heavy use of pesticide on some crops, there is also a need to provide some safeguards for the consumer through the enforcement of effective pesticide residue laws as they relate to food products. Certain quality standards need to be developed and enforced with milk and other food products as well.

Appropriate laboratories need to be established to provide the basis for enforcement of these laws. Small fees or taxes could be levied on the products involved to cover the cost of needed inspection and control programs.

We recommend the creation of a Division of Analytical Services--to provide the needed support for these control programs. This division would include a seed laboratory along with chemical laboratories for the analysis of feed, fertilizers, pesticides (both pesticides products and pesticide residues) milk, and other foods where necessary. Some of these functions are now carried out by the Experiment Station. With the relocation of the Experiment Station as proposed, some of the facilities at La Calera could possibly be retained by the Ministry to carry out these analytical functions.'

There are numerous other services which could be carried out by the Ministry. There is little indication of interest in adding these functions and since we do not consider them to be of critical importance we are making no recommendations concerning them. We suggest that a further, more detailed study be made of the service and regulatory functions of the Ministry (all those functions outside of ITAN).

Coordination within MAG

Although we are recommending the establishment of integrated programs of research, extension and teaching in ITAN, we would like to emphasize that cooperation of these units with the service programs of MAG will be even more important in the future than it has been in the past. As the organizations develop and continue to grow, they will have much more to contribute to the agricultural development of Nicaragua. Both will have an important role in this development, and cooperation between them will be needed more and more. Otherwise, there will continue to be unnecessary duplication or lack of coordination of these activities.

Quality of Personnel

This report has concerned itself primarily with reorganization of several components of the Ministry of Agriculture. Throughout the report we have repeated the need for more trained manpower and for a more efficient use of the available human resources. We feel that the suggested organization will achieve these goals. However, we would like to emphasize that no amount of reorganization will result in outstanding service to agriculture unless men of first-class training and ability are involved. The organization will never be better than the professionals who carry out the day-to-day tasks. Unless, the proposed organization can attract and keep these men, and allow them to contribute to the fullest extent of their abilities, the objectives of this report will not be realized. Professional and economic incentives should be adequate to provide an ideal working environment.

APPENDIX C

Coordination of Agricultural Programs

Many organizations, agencies, and groups--both public and private--are concerned with agricultural development in Nicaragua. There is evidence of considerable overlapping and duplication of efforts among these groups.

Furthermore there is a great vacuum in agricultural leadership; no one organization, group, or individual is providing direction or leadership to a total agricultural development effort for the country. As a result, many groups are pursuing independent courses--sometimes at cross purposes with each other. The absence of coordination and leadership is, at the least, keeping the country from making the kind of progress in agricultural development which might otherwise be realized.

The proposed creation of ITAN should provide effective coordination of the agricultural research, teaching and extension functions. However, there is a great need for some vehicle through which the efforts of all the other agricultural groups might be effectively coordinated.

To accomplish such a goal we recommend the creation of a National Agricultural Commission, responsible to the President, or perhaps to the National Economic Council. The Commission might be chaired by the Ministry of Agriculture and would have the following additional ex-officio members:

President of INFONAC
President of IAN
President of National Bank
President of Central Bank
President of INCEI
Director of Coffee Institute
Director of National Planning
Office

Director General of ITAN
Director of Agricultural Experiment Station
Director of Agricultural Extension Service
Director of National School of Agriculture

In addition, the commission would have appointed representatives chosen from the ranks of outstanding leaders in the following fields:

- | | |
|---------------------|---|
| 1 - cattle producer | 6 - individuals representing other commodity interests |
| 1 - cotton producer | 2 - representatives of agricultural business and industry-- |
| 1 - coffee producer | (fertilizers, insecticides, farm equipment, etc.) |

The appointed members would serve for three years, with 1/3 being replaced each year. Efforts should be made to achieve good regional distribution of the appointed members. Membership should be kept flexible to accommodate new organizations or groups which should be represented.

There should be an executive secretary to carry on the staff work of the Commission.

One of the first tasks of the Commission would be that of carefully studying the responsibilities and functions of each agency--to determine areas of overlapping and duplication, and to delineate specific areas of responsibility. If there were areas of disagreement which could not be resolved by mutual consent, the matter should then be settled by executive decree or appropriate legislative action.

In the absence of a Civil Service system the Commission should elaborate and approve some uniform job and salary standards for technical personnel in the various agricultural agencies.

The principal functions of the Commission would be to provide a vehicle for planning and implementing programs of agricultural development on a well coordinated basis. For example, the Commission might agree that there should be an intensive campaign to increase the production of beef cattle. Specific plans would be developed within the Commission to carry out such a campaign. Essentially every organization on the Commission could make a contribution to such an effort. There would, in fact, be one well coordinated livestock production program for the country--with all groups working toward the same goal.

To provide effective planning, coordination and leadership for individual commodity programs the Commission would have committees concerned with the major agricultural enterprises, such as corn, cotton, beef, etc. These committees would be composed of representatives of the different organizations on the Commission at the "working" or technician level. For example, the beef cattle committee would include the leader of the beef program in ITAN, plus livestock specialists from the National Bank, IAN, INFONAC and other organizations--as well as representatives from the industry, cattle producers and others who would contribute to the program.

Such commodity committees working within or under the Commission would be responsible for developing the specific details of a program for each commodity. Once such programs are approved by the Commission, the committee members would be in a position to assume the leadership in carrying them out through their respective organizations.

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Individuals and Institutions Visited

The following officials and personnel provided information in interviews which was used in this report.

Ministry of Agriculture

Minister -- Alberto Reyes R.
 Vice-Minister -- Rodrigo A. Salmaron A.
 Director of National Agricultural School -- Orlando Lindo E.
 Director of Experiment Station -- Enrique Cerda
 Director of Extension Service -- Luis Alberto Osorio G.
 Director General of Agricultural Service -- Carlos M. Marin J.
 Director General of Livestock Services -- Carlos Castillo
 Director of Natural Resources -- Ruben Camacho
 Chief of Agricultural Economics -- Sergio Callejas
 Agronomist -- Angel Salazar
 Chief of Horticulture -- Jose Gonzalez
 Chief of Soils -- Antonio Prego
 Chief of Seed Certification -- Benedicto Flores
 Chief of Livestock -- Jose Wong Valle
 Chief of Agricultural Engineering -- Alcides Tijerino
 Chief of Agricultural Pests -- Alvaro Sequeira
 General Extension Supervisor -- Claudio Perez
 Agricultural Economist -- Luis Mena

Ministry of Education

Minister - Dr. Jose Sanson Teran
Vice-Minister -- Mauricio Pallais
Vo-Ag Program Director -- Ricardo Schneegens

Central Bank

President -- Francisco J. Lainez

National Bank

General Manager -- Alfredo Cole

National Planning Office

Director -- Antioco Sacasa
Economics -- Edgard Sevilla
Agriculture -- Jose Lainez

INFONAC

Director General -- Alfredo J. Sacasa
Chief, Agriculture -- Edmundo Astorga

INCEI

President -- Cesar Guerra

Agrarian Institute

President-Director -- Rodolfo Mejia Ubilla
Assistant Director -- Alfonso Blandon

Coffee Institute

Director -- Robert Harding

University of Nicaragua

Rector -- Carlos Tunnermann Bernheim
Planning Commission -- Miguel Vijil
Director, Chemistry -- Oscar Aragon Valdez
Biology Department -- Romulo Valerio, Frank Bendana

AID/Nicaragua

Mission Director -- Ralph J. Burton
Program Director -- Charles B. Johnson
Rural Development Officer -- W. Bailey Pace
Assistant Rural Development Officer -- Elton Ford
Agricultural Advisor -- Ben Nelson
Rural Development Advisor -- Armando Gonzalez

USDA/PASA

Chief of Party -- James L. Paschal
Rural Credit -- Ray Deschamps

USDA/Washington

Administrator, IADS -- Matthew Drosdoff
Deputy Administrator, IADS -- Gerald Tichenor
Regional Coordinator, Latin America, IADS -- A. J. Nichols
Regional Specialist, Latin America, IADS -- Ralph Battles
Central America Officer -- Marshal Fox
ERS Western Hemisphere -- Charles Davenport
ERS Central America -- Mary S. Coyner

AID/Washington

Director, Office of Institutional Development -- Leveo Sanchez
Rural Development Division, LA/ID -- Albert Brown
Rural Development Division, LA/ID -- Virgil Peterson
Officer, Nicaraguan Desk -- Carter Collins

